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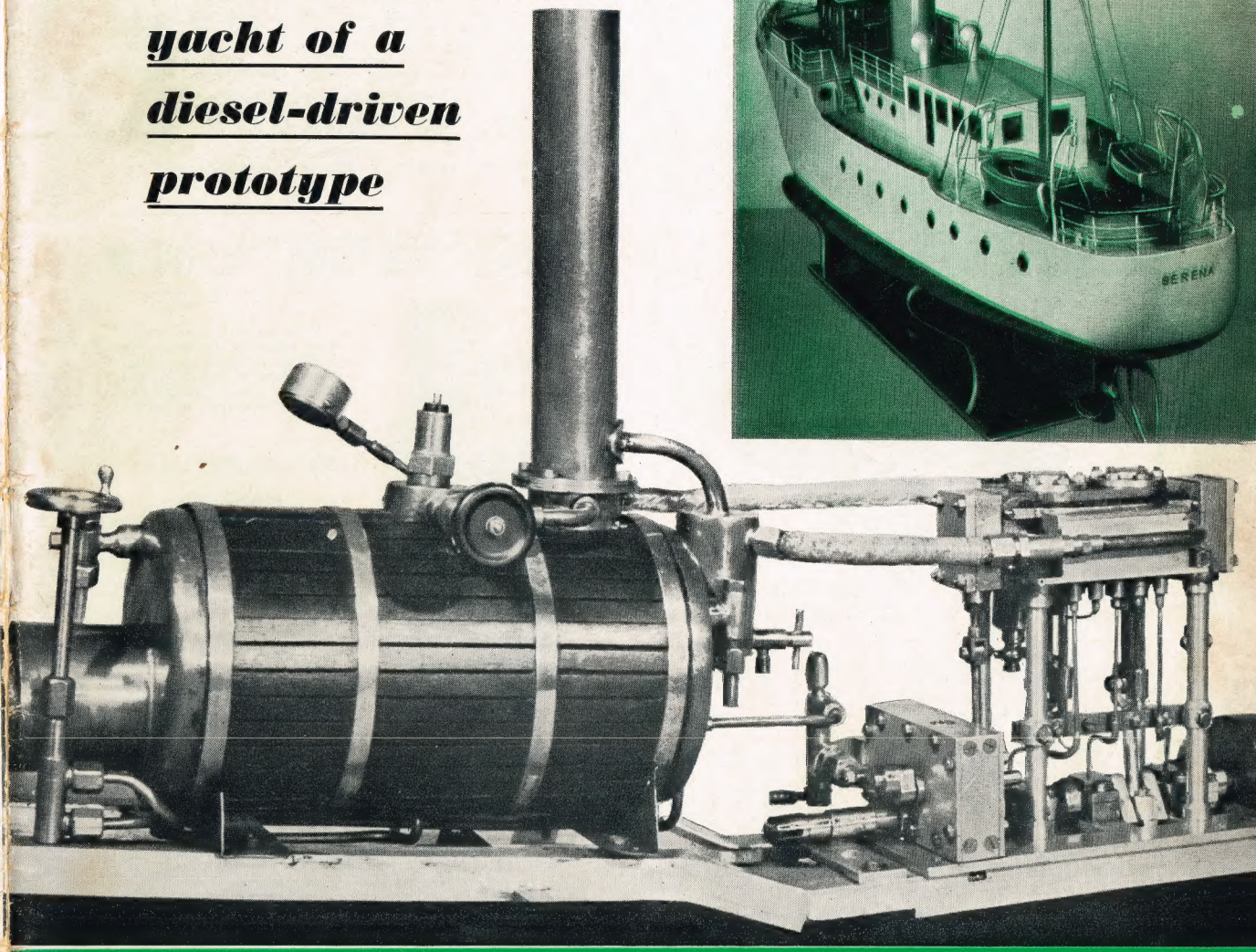
Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

SERENA

A model steam yacht of a diesel-driven prototype



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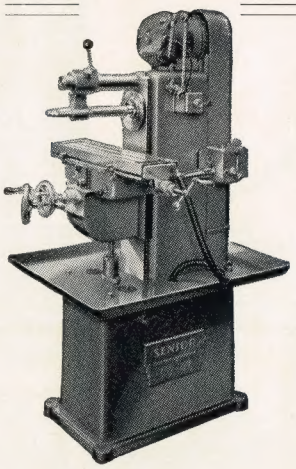

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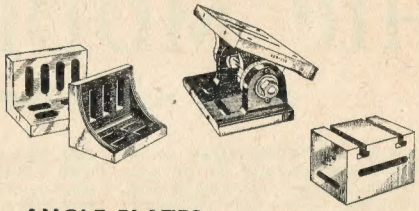

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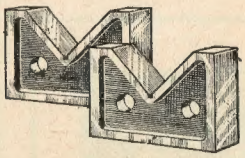

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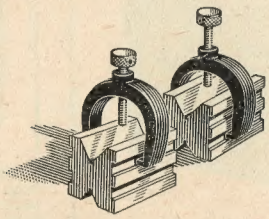

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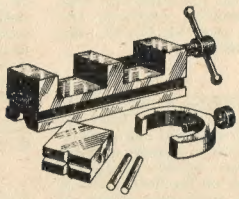

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Model Engineer

27 JUNE 1957 VOLUME 116 No 2927

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Incorporating SHIPS AND SHIP MODELS

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NEXT WEEK

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Cowboy locomotive: Model of the Shay engine, one of the most unusual designs ever built

Old Ironsides: The story of the USS Constitution

Steam generator

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Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

IT WILL not have escaped the attention of readers of MODEL ENGINEER—not much does pass by without remark as we know to our pride and occasional sorrow—that the serialised description of the ME Allchin traction engine has been going on for a long time.

I am glad to report, to parody the famous Churchillian phrase, we have finished the end of the beginning and we are now approaching the beginning of the end ! In the next few months, the remaining articles in the series will be published and the serial will come to its conclusion.

It has been a long time partly because of the amazing complexity of its contents and partly because of the ill-health of the author, W. J. Hughes. I am happy to say that Mr Hughes is now in better health and I have no doubt that he will be turning to other aspects of traction engine modelling in future articles.

Some already finished

I think it is true to say, however, that the description of the ME Allchin is in far greater detail than probably has ever been given before. Such descriptions cannot be hurried and to that fact is added the complication that Mr Hughes is a very busy schoolmaster at Sheffield, with limited spare time.

Several model engineers have anticipated the finish of the articles and have completed their models. That is by no means unusual and there are many precedents for models to be built almost before the ink is dry on the opening chapters of a serial in MODEL ENGINEER.

It is obvious from the large number of drawings which are sold for ME Allchins that many models are being built in different parts of the country. Perhaps the speed of publication has kept pace with the speed of construction for the average model engineer !

Heart of Oak Exhibition

AN exhibition of special interest to ship modellers was opened at the National Maritime Museum on Thursday, June 6, by Sir Albert Richardson.

All who take an interest in historical ships and ship models have heard of Anthony Anthony's famous Roll of 1546 in the British Museum, Matthew Baker's notes on ancient shipwrightry, and his drawing of an Elizabethan ship of 1586, and Dummer's draught of a man-of-war in the Pepysian Library, Cambridge; but here are the originals for all to see. The Admiralty Library and The Institution of Naval Architects have also contributed items of great historical value.

On the walls and screens are displayed a number of the original draughts of British Naval ships from 1700 onwards, and several examples of Dutch, French, American and other draughts are also to be seen. In addition there are a number of important contemporary models of

Smoke Rings . . .

wooden ships, examples of shipbuilder's tools and equipment, notebooks and sketches.

This is probably the most valuable and the most authentic collection of information on wooden shipbuilding ever to be brought together, and one the shipmodeller, whatever his special interest, cannot afford to miss. If he specialises in models of historical ships he will certainly wish to pay more than one visit. The exhibition will probably remain open for a month or two, but an early visit is recommended so as to leave time for subsequent visits.

Heat from the sun

WHEN we stand in the sun we feel its warmth; when we retire to the shade we feel cooler—an experience which presupposes that heat reaches us from the sun in the same manner that it does from a fire.

But is it really so? Hot tea put into a vacuum flask will stay heated for hours, thus establishing that heat cannot pass through a vacuum but depends on the physical presence of air, or some other medium, for its transference.

Yet there is a 93,000,000 mile vacuum between us and the sun, so heat clearly does not reach the planets in the normally accepted sense.

I have heard it argued that the sun's heat reaches us in the form of radiation which generates warmth when it impinges on physical objects, which act in the same way that an impedance does in an electrical circuit.

This sounds feasible enough but why is it that an aeroplane gets much hotter from the sun's rays when it is standing on the tarmac of London Airport than it does when flying at, say, 30,000 ft where severe icing troubles can occur?

And what kind of radiations are they that can dry up an area like the Sahara, yet be stopped by a piece of tissue paper?

Model steam yachts

THE article on the model steam yacht *Serena* by A. Braddock in this issue reminds me that vessels of this type were once very popular among model power boat constructors, but apart from a few sturdy veterans which have been sailing the ponds for many years, they do not seem to be much in evidence at the present day.

There is, however, a good deal to be said in favour of the steam yacht as a subject for prototype modelling, as the form of hull is graceful and efficient, and better suited to the installation of a powerful steam plant than some of the popular modern types of hulls, especially in the matter of vertical space.

The navigability and seaworthiness of these craft are usually very good, and they can be built with complete upper works and deck fittings in correct scale, without involving flimsy details, unsuited to the rough usage incurred in regular duty on the pond.

Steam yachts have in the past won many competitions in steering and other prototype events, and they never fail to enhance the interest and variety of model power boat regattas.

The letter stamps issued by the Talyllyn Railway Company. They are in red and green, with black pictures. Their face value is 11d., and they were introduced last month

Cover picture

The steam yacht SERENA *by A. Braddock, of Oldham. All the running controls can be reached by lifting off the aft deckhouse. The feed pump and bypass valve are on the extreme left. Mr Braddock writes about his boat on pages* 913 *to* 915.

Freight timetables

FOR the first time in the history of Britain's railways freight timetables will be available to the public. This news was given by Mr David Blee, the LM Region general manager, when disclosing recently British Railways' plan for comprehensive reorganisation "to bring management closer to the job."

Mr Blee said they wanted manufacturers and other people in industry to realise that they could rely on freight trains running to schedule exactly in the same way as passenger trains.

The scheme will start in the London Midland Region, which will be divided into six divisions, each with its own traffic manager. As divisional heads will be answerable to the main board only on questions of high policy—such as fares—the divisions will be almost self-supporting.

Guide needed

LETTERS are already reaching this office from overseas visitors who are timing their arrival to coincide with the Model Engineer Exhibition in the last 11 days of August.

One of the American readers, H. Fox of 6129L, South Avenue, Oakland, California, would like someone to show him London. He is 50 years of age and is mainly interested in flash steam, models and steam cars. In particular he hopes to visit Bassett-Lowke, Doron and Foyles, and to see some boats at Victoria Park.

Mr Fox suggests someone from MODEL ENGINEER. Unfortunately this is for us an extremely busy time of the year, precisely because of the Exhibition, and I am wondering if one of our readers would like to show Mr Fox around.

"I would treat him to lunch and dinner in the best places and take him and his wife to the Palladium in the evening."

Mr Fox is visiting other parts of Europe and is going to Denmark before coming to England.

CONSTRUCTING THE $\frac{3}{8}$ in. SCALE STEAM YACHT

SERENA

Part 1

A. BRADDOCK offers these constructional details for the man who has little time to pursue his hobby

THE MODEL was started in 1939 and not completed until 1956, mainly due to long periods of absence from home, and to heavy professional commitments. In consequence, progress was often at a standstill for months, and sometimes for years.

No particular prototype was followed, but *Serena* is intended to represent a diesel yacht of the mid-thirties, except that a single propeller is fitted in place of the more usual twin screws of the full-size vessel.

The prototypes were usually of 100 to 120 ft overall length, and *Serena* has an overall length of 41 in. and a beam of 8½ in. Displacement is about 20 lb. While these dimensions are convenient for transport, and make possible a very seaworthy hull, they provide only a restricted amount of displacement for both steam plant and radio gear, and I would advise anyone fitting both these to consider a hull of about double the displacement.

Propulsion is by a twin-cylinder steam engine of ½ in. bore × ¾ in. stroke, with centre-flue boiler and petrol blowlamp. An engine-driven boiler feed pump is fitted. Radio gear of very simple type controls the steering only.

HULL

The general design of the hull is from that described by Mr H. B. Tucker, the noted model yacht designer, and is seaworthy, stable, and easily propelled. I copied the underwater body as exactly as I could, but made considerable alterations to the hull above the water line, giving *Serena* a rounded stern and considerably more flare in the bows than in the original design. The upperworks, too, were added as fancy dictated.

Construction follows orthodox plank-on-rib methods, using a building board on which the moulds are erected. The "backbone" is built up from three pieces of 1 in. oak, glued and screwed together. The propeller skeg and carved out sternpiece are made from yellow pine.

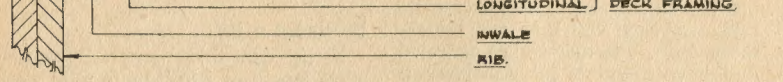


Fig. 1: Method of fitting deck (transverse section)

Inwales are of ¼ in. mahogany, and are duplicated in the forward part of the boat to strengthen the bow in case of collision, but I doubt if this precaution is really necessary, the general construction being amply strong; I recently dropped the whole boat stern first on the floor, and the only damage sustained was a dent in the transom.

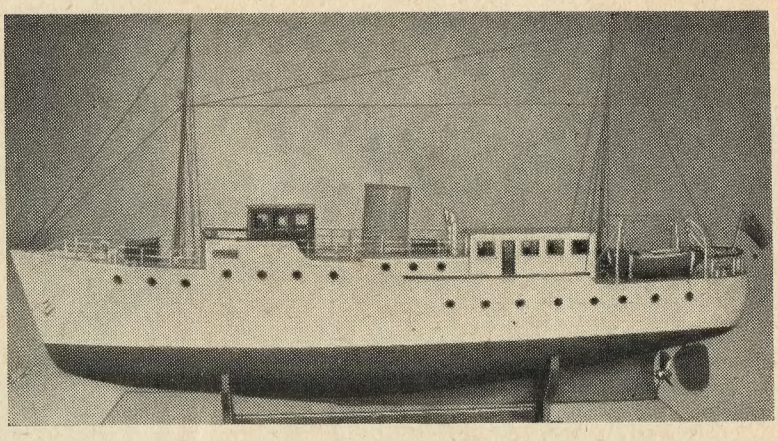
Ribs are of oak, ⅜ in. × ½ in. section, and steamed to follow the curves of the moulds. A simple device for steaming the ribs is made from three or four cocoa tins, all but one of which have their bottoms removed, and are soldered end to end. In the lid of the topmost one is fitted a good sized cork which has a hole drilled axially to accommodate a 2 ft length of ½ in. dia. tube (glass for preference, but copper or brass will do).

The whole contraption is secured in a vertical position over a bunsen burner, about half a pint of water placed in the lowest tin, and the lengths of wood for the ribs erected inside. When the water boils, it fills the tins with steam, but as the steam comes in contact with the cold glass of the tube, it condenses and runs down inside the tins again. In this way, loss of water by evaporation is prevented, and the device may be left unattended for the two or three hours necessary to soften the ribs thoroughly.

The ribs are secured to the backbone and inwale by ⅜ in. No 1 countersunk head brass screws.

The planks, of which there are 14 each side, are cut from ½ in. yellow pine and are secured to the ribs by ⅜ in. × 20 s.w.g. copper pins, obtained from Bonds o' Euston Road. After removal of the building board and moulds, the heads are punched below the surface, and the projecting ends clenched over the inside. The glue used was at first Casco casein glue, and later, when this became available, Aerolite 306 synthetic resin glue.

The decks are arranged to be completely removable, so as to provide the maximum ease of access to the power plant. This is a policy which has proved to be very much worth while, as the radio gear was added as a later development, and it proved possible to instal it without any alterations such as would probably



have been necessary with fixed decks.

The material used for the decks is resin bonded plywood 1 mm. thick, supported on a framework made from strips of mahogany and pine left over from the hull building. This framework is arranged to be a push fit inside the shelf formed by the inwales and the two fixed deck beams, the plywood being glued and pinned to the framework and overlapping the inwales, but not quite reaching to the projecting edge of the planking which forms the sheerstrake. The resulting small channel forms the waterway or scupper. The method is illustrated in Fig. 1.

I was a little doubtful about fitting only two permanent deck beams (at the forward and after ends of the raised bridge deck) in case hull distortion should occur through lack of transverse support, but in fact no such distortion or springing has occurred. This is probably due to the fact that the completely planked hull remained on the moulds for two or three years, and the hull timbers had by that time taken a permanent set in the required shape.

The wheelhouse is constructed from teak, and is of framed and panelled construction. This necessitated making many mortise joints in $\frac{1}{8}$ in. $\times$ $\frac{1}{4}$ in. strips of teak, and grooving for the panels which are $\frac{1}{16}$ in. thick. The process was especially tricky at the front of the wheelhouse, which is curved in two planes to match the curvature of the forward end of the bridge deck and the camber of the deck.

The two wheelhouse doors are arranged to open by means of hinges about $\frac{3}{16}$ in. long, which were made from stainless steel in the following manner (Fig. 2).

A short length of stainless steel tube cut from a hypodermic needle is laid on a scrap of thin stainless steel sheet and silver soldered in position. The sheet is then filed off flush with the edge of the tube which is filed away in segments by means of needle files to form the hinge section, after which the holes for the securing screws (obtained in this instance from a pair of spectacles) are drilled, and the piece cut up to form as many hinges as are required. A short length of fine brass wire serves as a hinge pin.

Although this process sounds simple, I can assure readers that it is by no means so in practice. My many attempts at making hinges all disappeared, having been dropped among the shavings on the workshop floor, and the credit for producing at long last two pairs of working hinges goes to my father, whose patience (and skill) in such matters is greater than mine !

The wheelhouse contains binnacle, steering wheel and engine room telegraph. The method of making the steering wheel may be of interest, since it was made by my father in the days before we possessed a lathe.

A strip of sheet brass is prepared, the cross section of which is the same as that desired in the rim of the finished wheel. In this strip eight equally spaced holes, at $\frac{1}{4}$ in. centres, are drilled, leaving $\frac{1}{8}$ in. between the centre of each end hole and the end of the strip. The strip is then annealed, and bent round a suitable piece of bar to form a circle, after which the two ends are silver soldered together. The result is a rim with eight equally spaced holes for the spokes.

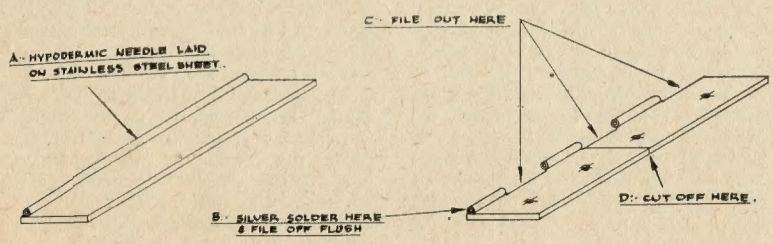


Fig. 2: Method of making hinges

A similar piece is prepared for the boss, but having the holes drilled at $\frac{1}{8}$ in. centres, making a ring half the diameter of the rim. Spokes are made from short lengths of stout brass pins, sweated in position with soft solder. This method produces a steering wheel a little over $\frac{3}{4}$ in. diameter.

All bright brasswork in the deck fittings is finished by the application of a single coat of clear cellulose (Belco). This preserves the brightness very well, and seems much simpler than the hot and cold lacquering processes sometimes advocated.

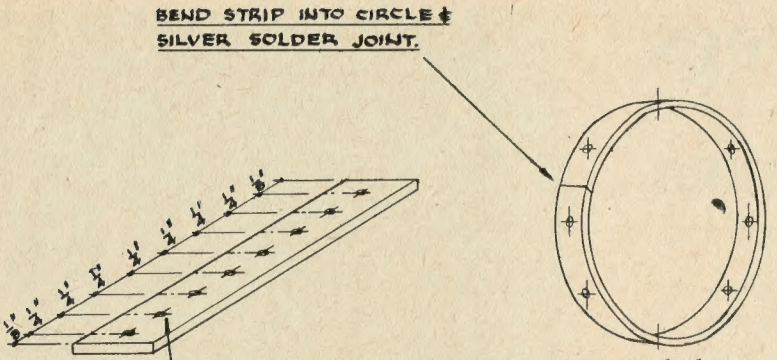
The funnel is made from 0.005 in. shim brass stock, rolled round an oval hardwood former, and with a lap joint down the aftermost edge. Half-round brass beading is secured to the top, and a brass flange to the base, by means of silver solder.

Stanchions for the deck rails proved to be a major headache, as over three dozen were necessary They are mainly three-ball, and $1\frac{1}{8}$ in high to the centre of the top rail After some experiment, they were turned from $\frac{1}{8}$ in. Sifbronze brazing rod, as this appeared to be tougher and stronger than ordinary brass rod.

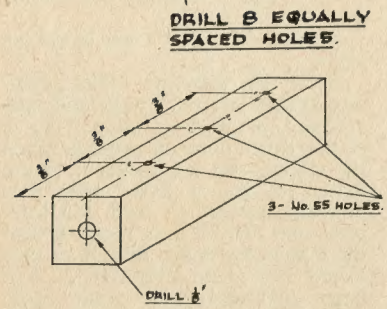
Preparing a jig

A jig was first prepared from a short length of $\frac{3}{8}$ in. square mild steel rod. This was drilled axially $\frac{1}{8}$ in. dia. to accommodate the Sifbronze, and then drilled transversely with a No 55 drill in the positions required for the rails. Care was taken to get the transverse holes as nearly as possible on the centre line (Fig. 4).

The stanchions are made in pairs, and a piece of $\frac{1}{8}$ in. rod is cut off sufficient to make two stanchions, plus a small piece for chucking. Using a $\frac{1}{8}$ in. collet in the lathe, each end of the piece is turned down for about $\frac{1}{4}$ in. length and screwed 10 BA for the securing nut, using the tailstock die holder. A 10 BA nut and washer are run on to the screwed portion,



Above, Fig. 3: *Steering wheel rim*



Left, Fig. 4: *Jig for drilling stanchions*

and the rod inserted into the jig, the nut and washer acting as a stop.

The holes for the rails are drilled through the cross-holes in the jig, the rod reversed end for end, and the second stanchion of the pair treated similarly. The rod is returned to the collet, and allowed to project only so far as the first cross-hole. Using a V-point tool with the point slightly rounded, the base flange is then turned to size (3/32 in. dia.).

Next, the portion of the stanchion between the base flange and the lowest ball is turned to size. This will be about $\frac{1}{16}$ in. dia., as the full-size stanchion will be 1 in. to 1½ in. dia. The rod is now drawn forward from the collet sufficiently to expose the next hole, and the procedure repeated until all three plain sections of the stanchions have been turned.

The final procedure is to round off the projections surrounding the rail holes to approximately spherical shape by means of a fine file, and to part off.

Attempts to produce the ball by means of a form tool were unsuccessful, the workpiece repeatedly buckling under the heavy load imposed by the broad edge of the tool. To give added rigidity in the workpiece, $\frac{1}{8}$ in. rod was used in preference to 3/32 in., which would have sufficed for the finished diameter of the stanchion.

I was unable to obtain stainless steel wire for the rails, and so used cadmium-plated (or galvanised—I am not sure which) steel wire instead. No trouble has so far been noticed from rust.

Serena carries two small boats—a 12 ft pulling dinghy and a 14 ft motor dinghy. These are carved from the solid, with stemposts and keels afterwards glued into slots cut in the main body of the hulls. The wood used is hawthorn, obtained from a tree felled in a neighbour's garden. This proved very good for carving, as it is a close grained, even textured wood, with considerable strength in very small scantlings, the sides of the boats being about $\frac{1}{16}$ in. thick.

The Red Ensign at the stern is the work of my wife, who painted it in indian ink upon tracing cloth which had previously been boiled to remove the stiffening.

The two ventilator cowls were made from thin annealed sheet copper as follows. A spent bulb from a sparklet soda-water syphon was hammered into a block of lead until a hemispherical depression was formed. The copper sheet was interposed between the sparklet bulb and the lead block and the hammering continued until the copper sheet assumed the shape of the depression in the lead.

This formed the cowl of the ventilator, the stem being made from a piece of thin-walled brass tube, the end of which was cut off at an angle and filed slightly hollow to match the curve of the cowl. The two were then silver soldered together, leaving a generous fillet of solder to allow of subsequent filing to shape.

A hole was drilled up the stem into the cowl and excess metal on the inside of the junction of stem and cowl carefully removed by means of small scrapers and riffler files to reproduce the characteristic rounded throat of the full-size article as closely as possible.

A rim of thin wire was then soft soldered round the mouth of the cowl, and a small, turned brass flange to the base of the stem.

● *To be continued*

GEOPHYSICAL YEAR

AN exhibition to illustrate the scope and aims of the International Geophysical Year is on view at the Science Museum, South Kensington, until October 31.

The International Geophysical Year extends from the beginning of next month to the end of December 1958. During this period many scientists, representing more than 40 nations, will make simultaneous observations throughout the world of physical phenomena associated with the earth, sea and air. The results of this great enterprise are expected to yield the most complete picture ever obtained of man's physical environment.

The exhibition will include a representative collection of scientific instruments of the type to be used during the year. Earth satellites, high altitude rockets, the weather, earthquakes and the earth's magnetic field are among the topics to be illustrated. Less familiar subjects are the aurora, solar flares, cosmic rays, glaciology and oceanography.

An illustrated handbook, which is being published in conjunction with the exhibition, presents a general account of the phenomena to be studied and the observations to be made.

ELECTRIFYING GLASGOW LINES

PREPARATORY civil engineering work on British Transport Commission's £13m. scheme for the electrification of Glasgow suburban lines is making good progress.

Gangs of workmen equipped with three mechanical excavators and three Drott shovels (bulldozers with buckets) began the fourth and last stage of lowering the track in Finnieston Tunnel, between Partick Hill and Charing Cross stations. Purpose of this work is to secure clearance for the overhead conductor wires which will supply electric power to modern multiple-unit trains when the scheme is brought into service in 1961.

Excavation was carried out in sequence. A track relaying crane entered the tunnel and removed the permanent way of the opposite track. Then the excavating machines went into action. Following this operation a train-load of fresh ballast entered the tunnel and the material was spread to form a new base for the permanent way. The new track was then placed in position by the track-laying crane.

The line was closed to passenger and freight traffic for 24 hours.

Split housings for ball races

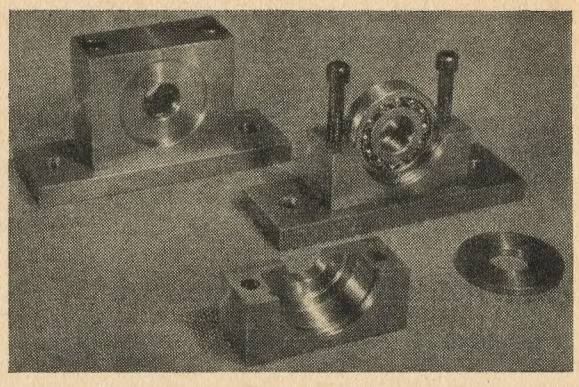


Fig. 1: *A typical split housing*

***MARTIN CLEEVE** describes a method which eliminates the need for heavy steel sections*

UNLESS castings are used, one of the chief obstacles to making housings for the larger ball races lies in the heavy section of steel which is required.

For example, to accommodate a $\frac{5}{8}$ in. bore self-aligning race, which has an outside diameter of $1\frac{9}{16}$ in., the minimum section called for is 2 in. × 1 in. or 2 in. square. While perhaps it is the most straightforward to machine from the solid, these large sections are not in all cases so readily obtainable.

It so happened that recently I required to house two of these $\frac{5}{8}$ in. races for a countershaft for a small lathe and, although I have a few feet of 2 in. square in stock, it was felt advisable in this case not to use it but to try another method using smaller sections; this partly to satisfy a whim and partly to make something more easily copied by interested readers.

Advantages

Of course, the idea of a split housing for a race is not new. Many hundreds must have been made by amateurs at various times, but quite often the material chosen is wood. Now though this is reasonably satisfactory, I think it will be agreed that the results lack finesse—not only from the fact that wood is rather out of place in engineering but also to the greatly increased size needed to gain the necessary strength.

This type of housing takes rather longer to make than the solid kind, but I feel sure that this will not be objected to. Indeed, I think many amateurs view the completion of a job with mixed feelings; glad it is finished but sorry there is nothing to do until a decision has been made as to what shall form the next task.

As is often the case when unusual lines are followed, the method of attack threw a clear light upon advantages which tended to remain hidden while in the "theory stages." Thus, the race(s) may be inserted or removed easily—and without the damage they sometimes suffer when being pulled from the solid type of housing. Removal is not affected by the presence or otherwise of the shaft.

It is as well to give reasonable dust protection to the races and, with the solid housings, it was my practice to provide "cover plates," each being fixed with four screws entering tapped holes in the main housing. Certain inconveniences inherent in this method when applied to the split type almost acted as a deterrent to carrying out the project, but it was decided to carry on and to leave the crossing of that particular bridge until later. Ultimately, I felt that the result was well worth while and to a certain extend novel. The cover plate was fitted easily, without the need for tapped holes or screws, by inserting it during assembly in an annular recess machined at the front of the main bore for the races.

Fig. 1 shows at the rear a fully assembled housing and at the front, a housing with the top half removed and the cover plate at the right; the $\frac{1}{8}$ in. wide × $\frac{1}{16}$ in. deep recess into which this fits may be seen quite plainly here. Upon separating the two halves after machining, the sectional view thus laid open is a very intriguing sight.

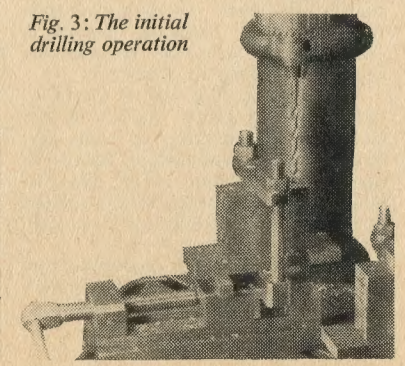


Fig. 3: *The initial drilling operation*

As is the case with almost every engineering job, the results and convenience of working depend to a certain extent upon the order in which the components are handled. As a matter of fact I have made four housings altogether, two for $\frac{5}{8}$ in. races and two for $\frac{3}{4}$ in. races, so had there been any undue difficulties they would have been discovered. The larger housings were each made from two pieces of $1\frac{1}{2}$ in. square, but as the principles apply for any size, for the sake of convenience, it will be assumed that a housing as dimensioned in Fig. 2, is being made, and it is proposed to give the sequence of operations with notes where necessary.

Planning the operation

Basically, the sequence consists in first securing the upper to the lower half by means of two screws entering tapped holes in the lower. In this case the lower is tapped right through so that the same hole serves to fix the base plate. It will be appreciated that this base plate is optional. In some cases where the housing is to be fixed to a steel structure the base can be omitted. But in this particular instance a base was added for greater convenience in fixing to slotted holes for ultimate belt tensioning.

Here, then, is a suggested line of procedure:

1 Cut four pieces of 1 in. square—say, $2\frac{1}{2}$ in. plus $\frac{1}{16}$ in. length.

2 Rough face each end to bring the lengths to $2\frac{1}{2}$ in. plus 1/32 in. This will leave a little for final facing after assembly. The plussage is not very important but it is advantageous to have all four of the same length.

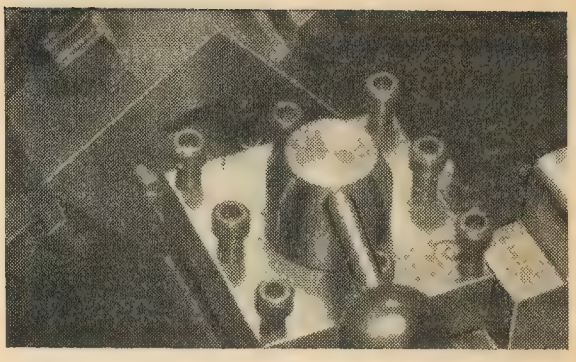
3 Cut two pieces of $1\frac{1}{2}$ in. × $\frac{3}{8}$ in. bright bar to finish $4\frac{1}{2}$ in. in length.

4 Pair up the 1 in. square pieces and decide which shall form the inner abutting surfaces and make distinguishing dot punch marks on

the ends of the pairs. Also mark the base pieces.

5 To ensure best results, the surfaces mating at the split should be flat. The rolled surfaces of bright steel, while flat enough for many jobs, probably will not be quite so for this; therefore take a very light facing cut over each and smooth the tooled surfaces with a file. For this kind of work I always use a single cut triangular file. This, being tapered along its length, offers a convex surface to the work and, with a little practice, one soon becomes accustomed to the feel and angle at which to hold it to remove small quantities of metal from any given spot. Continuing thus until the lathe tool marks are uniformly barely visible and following up with a light polishing by rubbing upon emery cloth laid on a flat plate, will produce surfaces showing a tendency to wring together. Similar remarks apply to the underside of the lower block, but provided the surface is not convex the finish need be only superficial.

Right, Fig. 4: Machining the annular recess for the cover plate



Below, Fig. 2: The split housing for the ball race

6 On the upper block of each pair mark and centre pop the positions of the bolt holes—not forgetting that a final end-facing cut after assembly will remove a little more metal—add 1/64 in. to the $\frac{1}{4}$ in. dimension shown on the drawing. Spot drill $\frac{1}{16}$ in.

7 A reference to Fig. 3 will now show how the blocks and bases may be drilled right through after adjusting for the symmetrical spacing of the base and clamping together. For this initial drilling a tapping size drill is used—for $\frac{1}{4}$ in. BSF a No 4 drill will give 85 per cent thread, No 3 drill, 75 per cent thread. This, by the way, took me 55 seconds per hole at 1,500 r.p.m. with an h.s.s. drill.

8 In each upper housing member open to $\frac{1}{4}$ in. clearing-letter F drill—and countersink for cap screws. If using drills for this operation, open out in 1/32 in. stages at a slow speed. Chamfer the undersides of the screw-heads to conform to the drill-lip angle.

9 Repeat (8) for *underside* of baseplate and lightly countersink all holes to remove burrs.

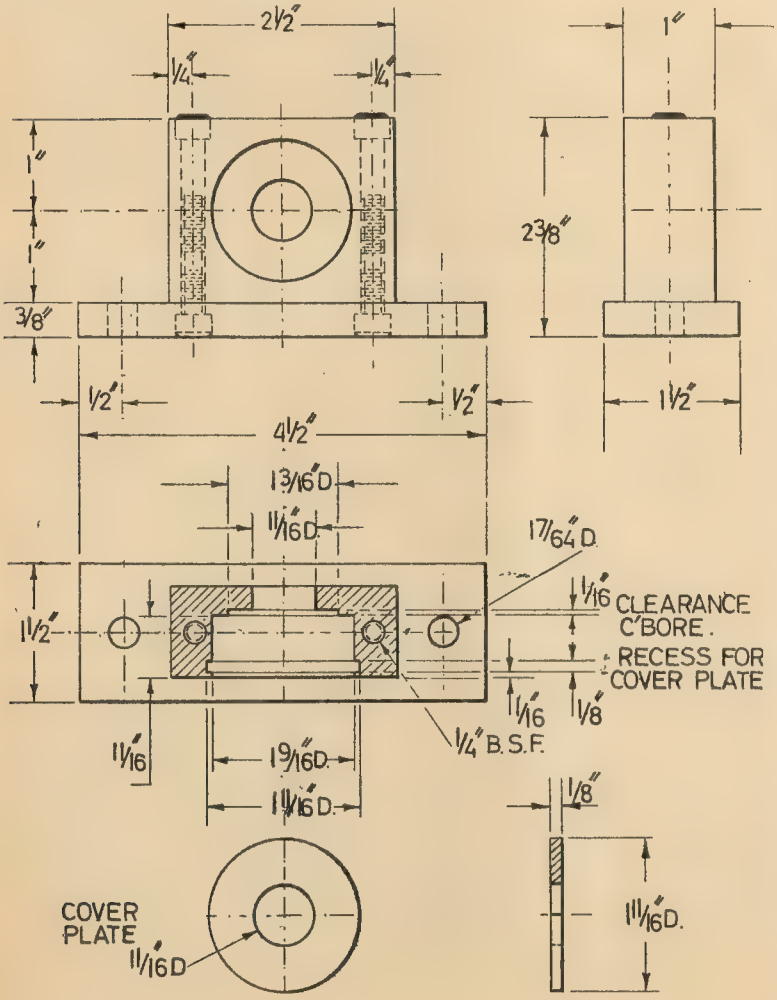
10 Thread the lower housing member. I tapped right through, but found the work harder than I had anticipated; $\frac{3}{8}$ in. depth of thread tapped from each side would have been ample.

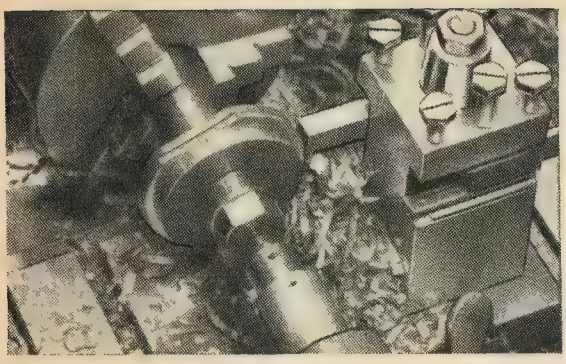
11 Lay aside the baseplates and screw together the half housings, mark the centre for the race hole and drill a small hole with a centre drill to facilitate setting up in the four-jaw chuck for the main boring operation. Use the tail-stock centre as an initial reference when setting in the four-jaw.

12 Drill right through—say, 15/64 in., $\frac{1}{2}$ in. and, if you have one, $\frac{5}{8}$ in.

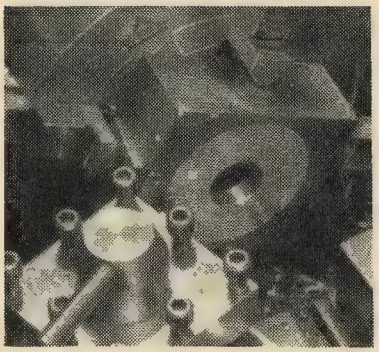
13 Take a facing cut.

14 Bore for the race—in this case to a diameter of $1\frac{9}{16}$ in. and to a depth of $\frac{11}{16}$ in. For boring this kind of hole which calls for the removal of a considerable amount of metal, I often use a tool shaped something like a knife tool but with about 10 deg. positive cutting rake and the usual liberal clearance necessary for boring. A saddle dead stop such as that described by the writer in MODEL ENGINEER for 4 October 1956 is also





Left, Fig. 6: Machining the cover plates (see operation No 17)



Right, Fig. 5: Facing off

very convenient to limit and control the depth of the hole being bored.

I find that the quickest way to remove metal is to, first " bore in " to a diameter of about $\frac{7}{8}$ in. by taking a series of rapid facing cuts. On reaching the " back " of the hole facing is changed to boring by saddle traverse, but I have also found that metal is more easily removed by " putting on " the cut when the tool is touching the back of the hole—and " dragging " it out with the saddle traverse handwheel. Roughing these holes by this means took me seven minutes each. After this, of course, light finishing cuts are taken until the race just shows signs of entering with slight persuasion.

At the rear of the main bore for the race there is a slight counterbore having a depth of $\frac{1}{16}$ in. and a diameter of $1\frac{3}{16}$ in. This is a clearance space for the inner portion of the ball race and gives ample room for any slight running out of line. If the $\frac{11}{16}$ in. clearance hole for the shaft is machined after the main bore, the $1\frac{3}{16}$ in. dia. may be gauged easily by a mere count of turns of the cross-feed handle; it will be understood that neither of these bores is critical.

Recessing tool

I have not included a picture of the actual boring operation as this seemed unnecessary in view of the recent series of articles on the swing-clear boring-tool holder, but this job was one of many which proved the value of this particular accessory. Having noted the reading on the feed dial for the final bore for the race, the tool was swung clear, thus giving space for the mounting of a recessing tool on the cross-slide.

15 Form the recess for the cover plate. My recessing tool is somewhat like a " stubby " parting tool formed at right angles upon the end of a piece of $\frac{5}{16}$ in. square h.s.s. It has no top rake. The cutting clearance is ground to a curvature to suit bores of not less than about $1\frac{1}{4}$ in. dia. For this job a speed of 93 r.p.m. was found satisfactory, a little coolant being applied with a brush. Incidentally, the term " coolant " although correct is, in this case, slightly misleading in that it did not have any cooling to do but acted as a lubricant for the tool and cut.

The saddle dead stop again proved useful for setting the tool before cutting. Here, the left hand tip of the recessing tool had to be $\frac{3}{16}$ in. " in " from the outside of the housing; touching the tool to the outer surface of the job, the stop rod was set and locked with its tip $\frac{3}{16}$ in. from the saddle which could then be traversed to the left by this amount. Groove depth was determined by counting 62 thou on the cross-feed dial after cutting had just commenced. To gauge the width of the groove a small piece of $\frac{1}{8}$ in. bright stock plate was drilled and nutted to the end of a $\frac{1}{4}$ in. screw. Having formed the first groove it was widened by taking a series of light cuts, moving the saddle to the right by small increments. A very tight fit for the cover disc is unnecessary.

Chamfering

The chamfering of all six projecting corners, which will be found in the bore, is an operation which should not be overlooked. The edges of the cover-plate groove are likely to be particularly sharp.

16 Reverse in the chuck and face off. This operation is shown in Fig. 5. I made the facing of the top and ends of the blocks a final operation as this seemed to lessen the chances of confusion.

17 Prepare the cover plates. For the sake of economy of material I made these from 2 in. × $\frac{1}{8}$ in. bright steel strip. Four pieces (two spare) were cut, drilled $\frac{5}{8}$ in. at their centres and mounted upon a threaded and nutted mandrel (Fig. 6). This illustration also shows a method of attack which I prefer for this kind of work. Here, a rear inverted tool, similar to a parting tool but much wider, is being fed directly on to the work by means of the cross feed and with the lathe in backgear. Cuts of $\frac{1}{4}$ in. width were taken. With this method it is unnecessary to saw off the corners of the plates. The cross feed is much more easily controlled than the saddle traverse, thus digging in and stalling are more easily prevented. The chips fall downwards with less risk to the eyes. Of course, once the corners have been machined away and the diameter is near the final required size, the discs were finished with a normal turning tool and the sharp corners broken with a tool or file.

Fitting races

When using ordinary bright mild steel as a shaft in conjunction with ball races a slight difficulty is often encountered due to the shaft being from about 1 to $1\frac{1}{2}$ thou under nominal size, making it a loose fit in the race. This circumstance may be overcome in a fairly satisfactory manner by making a series of centre-pop marks around the shaft at those points where it is desired to fit the bearings. A centre-pop mark raises up the metal surrounding the depression to a surprising extent so the operation should be carried out lightly.

In those cases where a shaft or spindle is small enough to mount in the lathe, a light knurling will be found to produce the desired result although even here the crests of the knurl may have to be reduced by light filing.

When using a race as a gauge to test the progress of the housing bore every effort should be made to keep it clean and free from stray pieces of swarf and grit. Short of taking to pieces, such debris is very difficult to remove, especially from some types of race wherein the balls are almost totally enclosed. Sometimes a jet of water will be found effective, while another satisfactory method is to shake vigorously together with paraffin in a small tobacco tin having a leak-proof lid. ▣

Connecting rod alignment

BEGINNER'S WORKSHOP

By GEOMETER

GIVEN alignment accuracy in the major components of an engine—crankshaft, main bearings, cylinder and piston—any fault must rest with the connecting rod; and this part more than the others may be subject to defects as a result of machining, dismantling or servicing.

In view of the comparatively slender proportions of a connecting rod, however much care is taken to ensure accuracy in machining it is possible for slight warping to occur due to release of stresses in the metal. In the case of a connecting rod having a clamped gudgeon pin, inappropriate handling when loosening or tightening the clamping screw can result in distortion. A badly-machined bush in a small-end will tip or twist the gudgeon pin—and the whole rod may be put out of alignment if a re-metalled big-end is machined inaccurately.

Apart from these possible defects it is important on occasion, owing to big-end off-sets, to fit connecting rods the correct way round; and when new pistons or gudgeon-pin bushes have been fitted, side clearance at these points of the assemblies is important.

For checking connecting-rod alignment, the essentials are, first, two well-fitting parallel mandrels—one for the small-end, the other for the big-end, each about 3 in. long for small connecting rods and about 6 in. long for car sizes. The set-up can be on a lathe or surface plate and, where an indicator is not available for use on the slide rest or surface gauge, careful observation of a round-ended pointer will suffice.

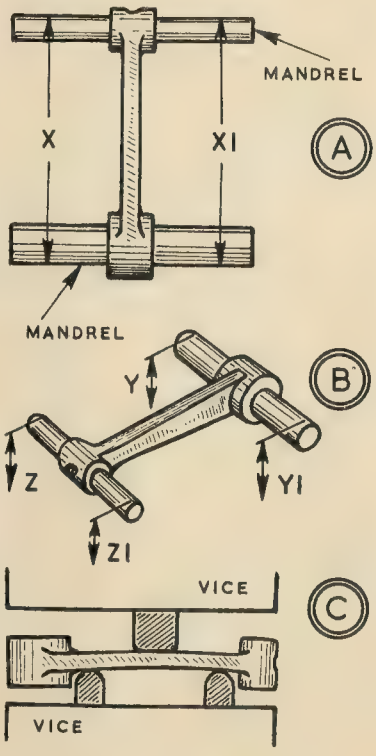
The two mandrels, which can be machined in the lathe, should be parallel in both planes when fitted in the connecting rod, as at diagrams *A* and *B*. Vertically, the dimensions *X* and *X*1 should be the same; while horizontally, as on a surface plate, *Y* and *Y*1 should be equal, as should *Z* and *Z*1. Dimensions *X* and *X*1 can be easily measured—particularly on small connecting rods—but the horizontal check requires a lathe or surface plate, or a jig as may be used for car connecting rods.

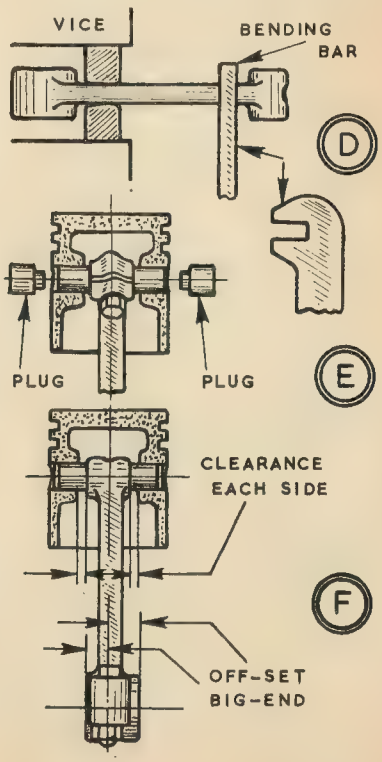
In a lathe, with the big-end mandre held truly in the chuck or between centres, an indicator or pointer can be mounted on the slide rest, then the connecting rod turned for the small-end mandrel to be tested each end, moving the indicator or pointer by the saddle. For the cross-check, the connecting rod must be supported for the indicator or pointer to pass over or under the small-end mandrel, using the cross feed. If the lathe has a flat bed, the surface gauge can be used for both tests. On a surface plate, the big-end mandrel is levelled on blocks or placed in V-blocks for *Y* and *Y*1 to check the same. Then *Z* and *Z*1 should be equal.

In practice, exact equality in dimensions is not easily attained, and a reasonable degree of error must often be accepted. On the short mandrels, differences in dimensions should advisedly not exceed 0.002 in. to 0.003 in., and on the long mandrels 0.005 in. to 0.006 in.

A bent connecting rod, with an error in the dimensions at *A*, can be corrected as at *C* in a vice using three blocks; where the malalignment is twist, with an error in the dimensions at *B*, correction can be made as at *D*, holding one end of the connecting rod by the web between blocks, and using a bending bar at the other end. Care is necessary, and "spring-back" must be allowed for, particularly in the latter operation—for which commercial alignment jigs often have screw adjustment.

Loosening or tightening a gudgeon-pin clamping screw may be done safely, holding the gudgeon pin endwise in the vice between suitable plugs as at *E*, whereas holding by the web may cause distortion. On car or multi-cylinder engines, observation should be made for big-end off-sets as at *F* and for small-end clearances during assembly, using a flashlight. ■





The MUNCASTER steam-engine models — 10

Continued from 13 June 1957, pages 841 to 843

EDGAR T. WESTBURY concludes this informative series with details of reversing gear and notes on Grasshopper engines

ALTHOUGH the Stephenson link gear is well known to most readers, some notes on its basic principles and essential features may be helpful to those who are approaching steam-engine construction for the first time, especially as it is often the subject of elementary queries.

Many readers who wish to design their own engines seem to find some difficulty in laying out the valve gear arrangement and adjusting it to give efficient results, despite the amount of practical advice on these matters which has been published in MODEL ENGINEER at various times.

This form of reversing gear employs two separate eccentric sheaves, which are positively fixed to the engine shaft in the positions as specified in Fig. 47, and these are connected by the usual straps, and rods of exactly equal length, to a curved slotted link, the radius of which is equal to the distance from the centre of the eccentric strap to the eye of the rod. Connection to the valve rod is by means of a die block which is a sliding fit in the slot of the link, and means are provided of raising or lowering the link so as to bring either eccentric rod into operation on the valve rod, or to any intermediate position.

Thus the rotation of the engine can be reversed by means of a simple manual control, which also serves to vary the expansion ratio as required. The control gear (not shown) consists of a lifting link and a connecting or "reach" rod operated by either a direct-acting lever or a quick-thread screw; large engines often have power-operated reversing gear.

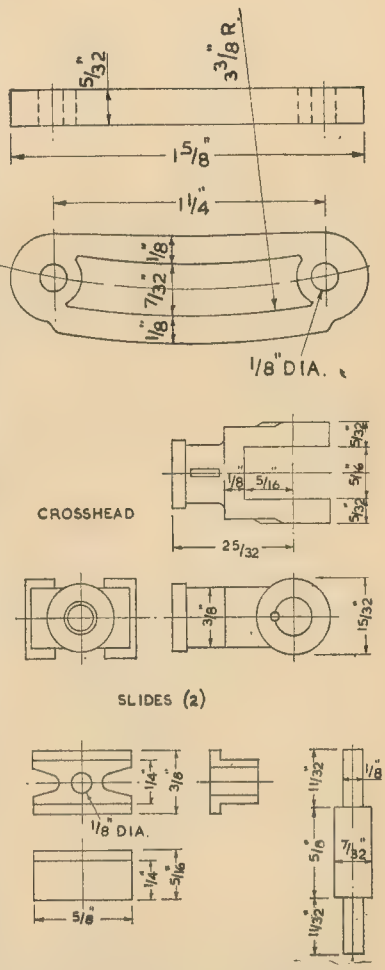
The essential components for the reversible engine are shown in Fig. 49. Important points to be noted are that as the eccentric rods are side by side, the end forks must be offset in alternate directions to line up with the link, but this offset should be as small as possible to ensure efficient mechanical action. The type of link shown is the most common, but it does not enable the eccentric rod to be lined up exactly with the valve rod due to the limits of the slot, and, therefore, the eccentric stroke must be made greater than the required valve travel. Modified types of links, such as the "launch" type, eliminate this discrepancy but involve their own geometrical problems.

If an error is made in the dimensions of the rods or links, valve setting will be impaired. One rod longer than the other will result in unequal port openings either in forward or reverse, or both; an error in the link radius will alter the settings as the gear is linked up. Lost motion due to slack fitting in any of the parts will result in reduction of valve travel and retardation of timing. This is but a brief sketch of the working principles of reversing gear; some excellent articles analysing the details have been contributed to ME by writers much better qualified to do so than myself.

There are, of course, a good many other types of reversing gears besides the Stephenson link employed on steam-engines, and some of them are claimed to have advantages for certain purposes, but they are generally more complicated in construction and more difficult to understand properly. Not only is the Stephenson gear by far the most popular type for the class of engines under discussion, but it is also one of the most satisfactory in practice because of its robust construction and the relatively small number of articulated working parts.

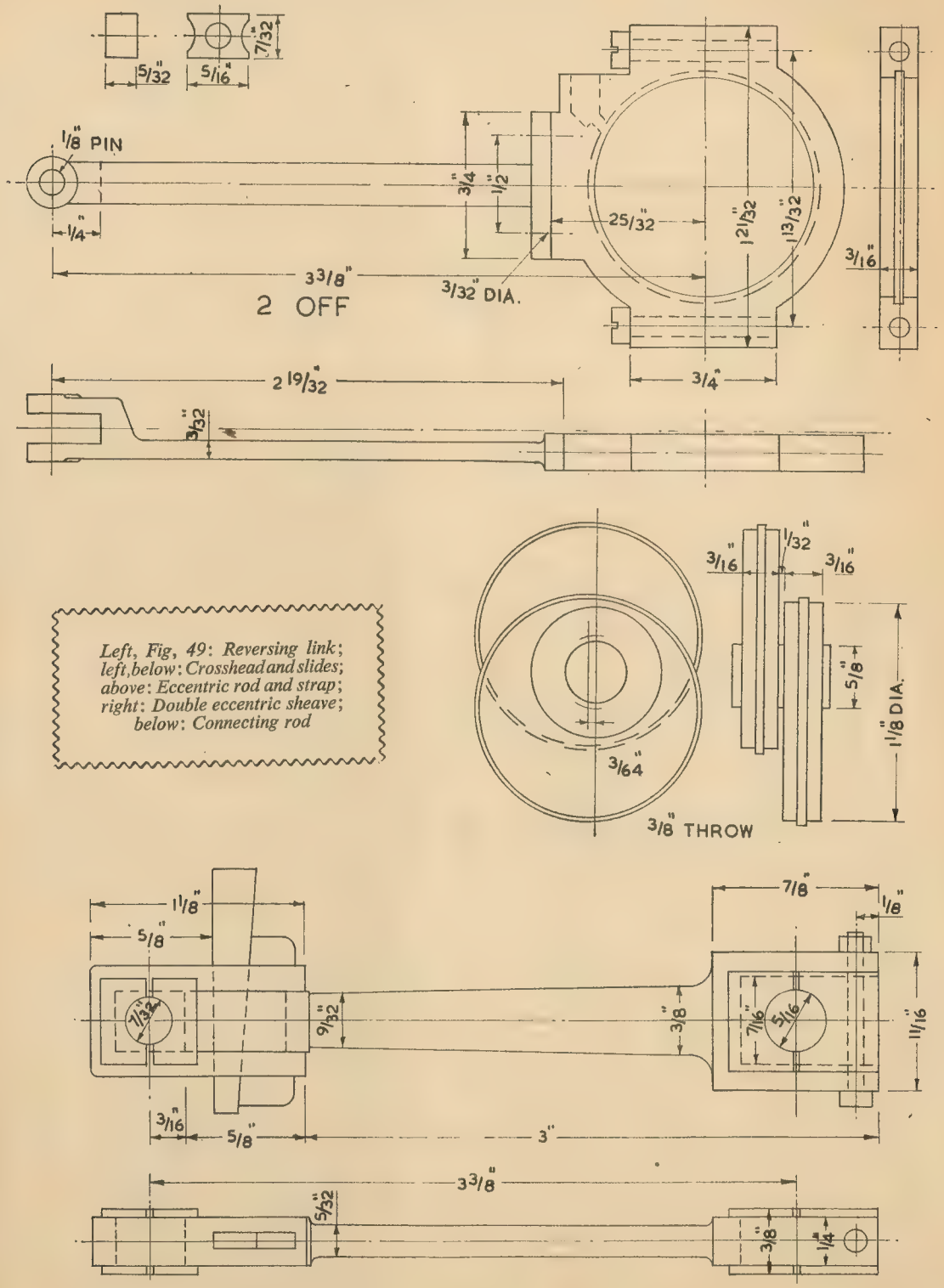
Occasionally, however, rather unusual types of steam-engine valve gears are encountered, and queries have been received from several readers on this subject, particularly in respect of single-eccentric reversing gears, such as the Hackworth and Marshall types. Space does not allow detailed discussion of these here, but they are fully explained in the ME handbook *Locomotive Valve Gears* by Lake and Reidinger, and there have also been quite a number of articles on valve gears published in ME at various times.

One of the most uncommon reversing devices I have ever seen was that fitted to the engine of a drifter in the Firth of Forth; it had a single eccentric, the timing of which was controlled by endwise movement of a spirally-splined sleeve inside the eccentric sheave. As the engine was old and well worn, there was a good deal of slack in all the working parts, which could not be taken up as readily as in more conventional valve gears, and it also lacked any provision for notching up to shorten cut-off.



GRASSHOPPER ENGINES

Several readers have asked me for some information on the Grasshopper type of beam engine, and I am,



Left, Fig, 49: Reversing link; left, below: Crosshead and slides; above: Eccentric rod and strap; right: Double eccentric sheave; below: Connecting rod

MUNCASTER MODELS . . .

therefore, giving a design of an engine of this type by Muncaster which was published in ME in 1934.

The special feature of the Grasshopper engine is the use of a single-ended beam anchored from one end, instead of being pivoted on central trunnions, as in the orthodox type of beam engine. The advantage of this arrangement is that the working end of the beam can be connected directly to the piston rod of the engine, and in this way it is possible to make the engine much more compact especially in the matter of height, as it eliminates the space taken up by the usual swinging links between the beam and the piston rod crosshead.

The length of the beam, or lever as it is called, can also be reduced; whereas in the normal beam engine the beam is usually at least three times the stroke in total length, that of the Grasshopper is generally about $1\frac{3}{4}$ times the length of the stroke and its weight is also proportionately less.

The working end of the beam is guided in a straight line by means of the usual parallel motion device, suitably modified for this particular purpose, and it is, therefore, necessary for the anchored end to be capable of lateral movement. This is provided for by a swinging link arrangement, which was usually made in the form of a cast rectangular frame with lattice, or cross strutting.

Although the weight of the Grasshopper beam is completely unbalanced, the fact that it is much lighter than the orthodox beam enables engines of this type to be run quite satisfactorily at higher speeds than the former type. The compactness of the general engine structure provided inherent rigidity, and also simplified mounting and installation, with very simple ashlar or brickwork foundations. The engines were, however, often sunk into the floor, or elevated to give space for an air pump and condenser under the bed and a race was provided to give clearance for the flywheel.

The air pump was sometimes driven from the gudgeon pin of the parallel motion, which was extended to carry the pump rod clear of the sweep of the crank pin. In some cases, however, an air pump having a stroke of about a third or a quarter of the cylinder stroke, and of correspondingly greater diameter, was employed, operated from a gudgeon pin nearer the anchored end of the beam.

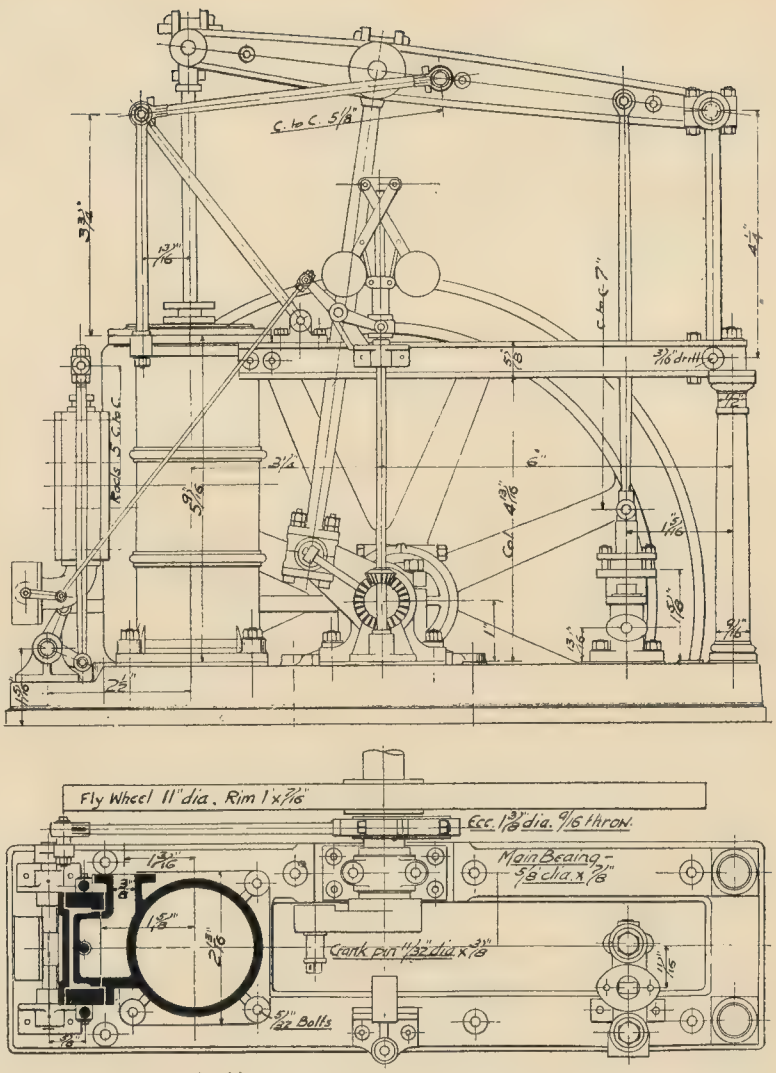


Fig 50: Elevation and plan of Grasshopper engine

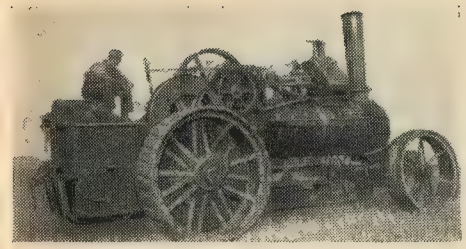
It will, of course, be apparent that the crank throw was considerably less than the half-stroke of the piston, but, even so, there was not much clearance between the cylinder and the sweep of the crank. For this reason, gib and cotter crankhead bearings were sometimes found unsuitable, and many of these engines were fitted with bolted split brasses of the marine type, as in the example seen in Fig. 50.

The connecting rod was made as light as practicable, and was, therefore, more often made of steel or wrought iron than of cast iron, as in many ordinary beam engines.

This particular design is for an engine of the high-pressure, non-condensing type, working on about 30 p.s.i., though some of the later examples of engines worked at considerably higher pressures, as more knowledge was available on the design of boilers and the safe stresses which could be allowed. Some of these engines were built up to well after the beginning of this century.

Among the distinctive features of the design may be mentioned the rather unusual method of driving the vertical shaft of the governor from a subsidiary or "follower" crank from the overhung crank pin. Although not specified in the design, this follower crank could also be used as a means of conveying lubricating oil to the crank pin; this feature was, however, more characteristic of

● *Continued on page 943*



A curious system of steam ploughing

described by GEORGE W. EVES

I WAS very interested in the Smoke Ring comments concerning the difficulties of steam ploughing with a single engine, and have been prompted to set down, the system known in my village as the " Tommy Dodd."

All this happened before my time, of course. But my information came from the same source as my story of Jack Johnson [ME 20 December 1956.] My father was ten when he started work with this form of steam ploughing and the name used to amuse me very much. I enclose a couple of sketches and a picture of the original engine—or, rather, what was left of it.

The contraption—and I have never read or heard of anything like it—was made and worked by Woods of Crockenhill, Kent. Originally it was a normal double-engine set of single-cylinder Fowlers, but one was destroyed by a boiler explosion, and as you can't do much with one engine, I suppose necessity was responsible for this particular system.

Tommy Dodds was the name given to the small four-wheeled trolleys with the centre pillar to which was fitted a split-clamping device similar to that employed with tubular scaffolding. In those days it was considered wrong to allow the cable to drag on the ground—hence these TDs were clamped on at intervals as the rope paid out. This engine's single drum was removed and replaced with two, one above the other, each of which could be engaged with the motion work; thus one pulled the cable in and the other paid it out freely.

On the far side of the field was a solid-anchor truck on four flanged wheels, the whole much the same size as the engine. The travelling wheels were set at an angle away from the engine. In the centre of the truck was a deep-flanged rope wheel fitted horizontally, in the same plane and height as the engine drum, and about 6 ft dia.; this was also at an angle away from the engine. (The sketch will, I hope, make this clearer.)

The pull on the engine tended to set the truck further into the ground, and the angle of the rope wheel stopped the whole caboodle from overturning. The cable from the engine went across the field to the rope wheel on the anchor truck, round that and back to the plough, and from the drag links back to the free running drum.

The rope wheel on the anchor truck was free running, but by means of a lever it could be put into gear to drive a small windlass. From this another cable was run to the far side of the field ahead of it, where an anchor was firmly fixed in the hedge, bank, or wood that happened to be there.

This anchor was much the same as its sea-going counterpart—the more the pull, the more it embedded itself in the ground. To this was fixed a snatch block. I suppose there is, in nautical circles, a proper term for this. It had six pulleys which reduced the pull-in to a snail's pace; thus when the windlass was engaged, the anchor truck moved very slowly forward. The truck was set " up " just as the plough was approaching the truck.

Two men handled the plough, one man being on the engine. Two boys did the rest with the TDs, one at each end of the field, clamping them on as the cable paid out across the field and *vice versa*. The boy on the anchor truck earned a nimble sixpence a week extra operating the truck moving gear.

Engaging and disengaging this mechanism was fraught with problems. But by watching the sag of the cable it eventually became routine.

Meant more money

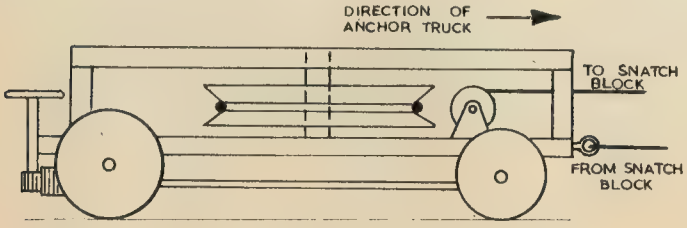
A fine sense of judgment was necessary, for the smaller the headlands, the more acreage money at the end of the week for the ploughmen. The engine driver received a few pence for the coal saved, but the boys collected nothing except boxed ears and harsh words if they allowed the TDs to get too close to the engine or truck before they were disconnected —for to stop the engine bordered on crime. Headlands were left on all four sides of the field, and the engine pulled the plough direct round and round the outside to finish off.

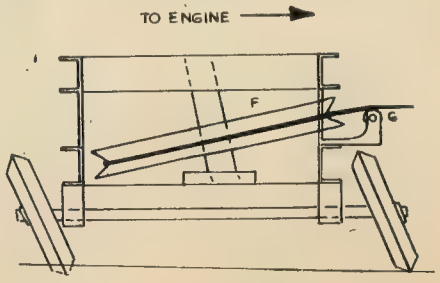
The engine illustrated is the original my worthy parent started with as a TD operator at four shillings per six-day week, 12 hours a day. Robbed of its mate, it was fitted with two drums, but after some few years another spare engine was acquired from a firm in Oxford, and it reverted to the double-engine set once more.

In 1902, the original engine was reboilered, and shortly after the single cylinder was replaced by the well-known Burrell single-crank compound cylinder, as was its mate. My father drove this engine in all its three changes, but with the last innovation it brought new and highly coloured words into Kent.

These compounds, with their massive unbalanced weighted crankshafts, were devils to stop on dead centre,

● *Continued on page* 943





MY GOODNESS, LIVE STEAM!

Yes, it's the Guinness Railway. A lovable little railway which, says JOSEPH MARTIN, is all the more Irish for its Swiss touch!

STRANGERS in Dublin—and Anna Liffey is luring more and more visitors every summer—may receive one of their first surprises near Kingsbridge Station when they see a little train cross the road with a man in front carrying a red flag.

To the average tourist this spectacle may be no more than an early assurance that Dublin is as Irish and different as he expects. The interest shown by the lover of locomotives and railways is likely, of course, to be less casual and I shall not be astonished if he follows the train on its cautious progress.

What our tourist has discovered, about a mile from the heart of Dublin's fair city, is the Guinness Train.

In two years' time the Guinness Brewery in Dublin will be celebrating its bicentenary. By the latter half of the nineteenth century the famous black stout from the city whose name means black pool was in such demand that the carts and horse-trams no longer sufficed for the brewery's transport, and it was decided, in the interests of more efficient working, to build an internal steam railway.

This was a harder task than it sounds. The brewery stands on the Liffey bank and the rising ground confronted the engineers with the problem of joining three different levels. Construction took place between 1873 and 1877 and at first a hydraulic lift was used to solve the difficulty of the considerable rise from the middle level to the upper level where the brewhouses are situated.

In 1875 Samuel Geoghegan—an Englishman can pronounce it Gogan without any great risk—was appointed head engineer. The rails were of 22 in. gauge (compared with the 5 ft 3 in. which is still standard gauge on the Irish railways) and Samuel Geoghegan increased their weight. He also designed new wagons and locomotives, bringing his inventive gifts to bear on one of the first problems which had exercised the builders. But his most remarkable achievement was a spiral tunnel.

This tunnel lifts the line in two and a half turns through the 25 ft from middle to upper level. It has a radius of 60 ft and a gradient of 1 in 39, leaving one to wonder what Samuel Geoghegan of Guinness—he retired in 1905 and lived until 1928—might have done in the wider world of railway engineering. Even so, his spiral tunnel gives the Guinness railway a Swiss touch—and all the more Irish it is for this!

The first locomotive, built in 1875, proved unequal in weight and power to the heavy loads, and in 1876 Mr Geoghegan bought two five-ton engines. They had large flywheels over the boilers, rather in the style of road steam rollers, and they were named, with simple fittingness, *Malt* and *Hops*.

I found a reference to *Malt* and *Hops* in a recent bulletin of the West Riding Locomotive Society. Writing of traction engine rail locomotives after one of them (a single-cylinder engine of $\frac{7}{8}$ in. bore, brought along by A. E. Tyler, of Harrow) had astonished the natives at Blackgates, W. D. Hollings gave the credit for building *Malt* and *Hops* ("Only 4 ft high, they were of 2½ n.h.p. and weighed 52 cwt") to an old Dorset firm, Lewins of Poole.

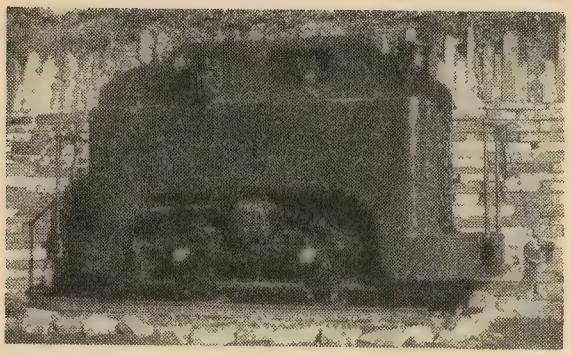
The next arrivals on the Guinness line were two six-tonners. Weights were gradually increased until in 1882 the maximum was reached with a 7½-ton engine designed by Mr Geoghegan himself. The Avonside Engine Company of Bristol built the prototype of the Geoghegan engine, but 18 others to the same design were turned out by William Spence of Cork Street, Dublin, a firm which no longer exists.

Embodying the best points of the earlier types while avoiding the unsatisfactory ones, these locomotives proved robust, reliable and altogether excellent. The best proof of their quality is that four of them can still be worked and were, in fact, operating early this year.

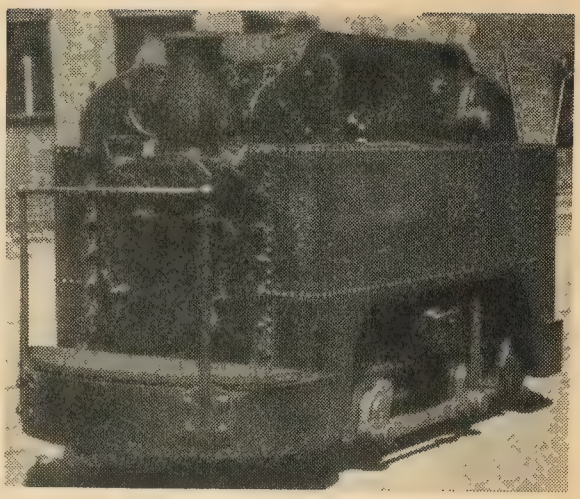
Each locomotive has two cylinders over the boiler. Transmission to the wheel cranks is by flexible, jointed, vertical side-connecting rods, and the engine can draw a load of 75 tons at a walking pace on the level or 18 tons on the stiffest gradient in the brewery. The water tanks, attached to the main frame plate at each side, hold 80 gallons, and the coal carried is 3½ cwt.

As for the principal dimensions, the cylinders are of 7 in. dia. × 8½ in. stroke, the boiler is of 2 ft 5 in. dia. (72.6 sq. ft), the steam pressure is 180 lb. and the two pairs of wheels are of 1 ft 10 in. dia. on a 3 ft wheelbase.

This photograph, a copy of an old picture reproduced in a Guinness Brewery guidebook of 1896, *is believed to show the very first Guinness narrow-gauge locomotive, hauling the passenger wagons that are still used today on brewery visits*



The Geoghegan locomotive No 13 *in position in the Talyllyn Museum in North Wales*



Right: This picture shows No 23 *of the old Geoghegan narrow-gauge steam locomotives, which is still in service*

[*Pictures by courtesy of Arthur Guinness Son and Co. (Dublin) Ltd*]

Every lover of old locomotives will feel well-disposed towards the Guinness company for the interest which it has taken in the history of its own railway and the respect which it has shown for the fine craftsmanship of other days. One Geoghegan locomotive has been presented to the Belfast (Northern Ireland) Transport Museum and the other, the Guinness No 13 Geoghegan, to the museum of the Talyllyn Railway Preservation Society, North Wales.

Ten years ago, the price and quality of coal having changed for the worse, the decision was taken to introduce diesel traction, and now the brewery is using 7-ton 37 h.p. Planet type 0-4-0 diesels, 12 of which were designed and built by F. C. Hibberd and Company, of London, who exhibited one locomotive at the South Bank during the Festival of Britain.

Anyone who imagines that the Guinness railway is a tiny affair—though none the worse for that—may care to know the size of its wagon stock. The wagons number 283. Seventy-five of them are flat double-bogie wagons of 1½ ton weight and the remaining 208 are four-wheel tip wagons weighing ¾ ton and having a capacity of 80 cu. ft. The flat-bogie wagons are used for carrying casks and sacked hops and the tip wagons for such loads as malt, spent hops and spent grain. All of them have coupling bars which allow them to be either pulled or pushed.

Add that the engine shed, a semi-circular building in the centre of the main brewery yard, is fitted with pits, a turntable and the usual appliances of a roundhouse, and it will be seen that the Guinness railway, 8½ track miles in length, can show the essential features of a main line system while having other characteristics which are entirely its own. It is this combination that makes a small railway peculiarly interesting to layman and expert alike.

Some 50,000 people visit the brewery every year. They are shown around in special wagons with back-to-back seats and canopies, and they are, therefore, able to enjoy the railway in the process of exploring an establishment which is famously part of the Dublin scene.

Most interesting of all is the layout itself. Odd as it may seem when we first hear of it, the narrow-gauge locomotives are used also for moving freights along the company's broad-gauge system which runs for a mile and a half; and the broad gauge connects with the Irish mainlines!

This connection is achieved through the adjacent headquarters depot of Coras Iompair Eireann, the nationalised transport service, at Kingsbridge. An electric hoist lifts the narrow-gauge locomotive, complete as it stands, to a broad-gauge haulage wagon where it rests on friction wheels coupled to the track wheels through gearing. As the wheels of the narrow-gauge engine turn, the haulage wagon is propelled along. I find this extraordinary.

In crossing from the brewery to the station the broad-gauge service uses a public road where buses, taxis and other vehicles are busy: hence the red flag. For the brief time of the passage the regulations laid down by the St James's Gate Tramways Act of 1901 are enforced with strict care. The man with the flag walks in front and the motion of the locomotive is covered to prevent the frightening of horses and danger to pedestrians.

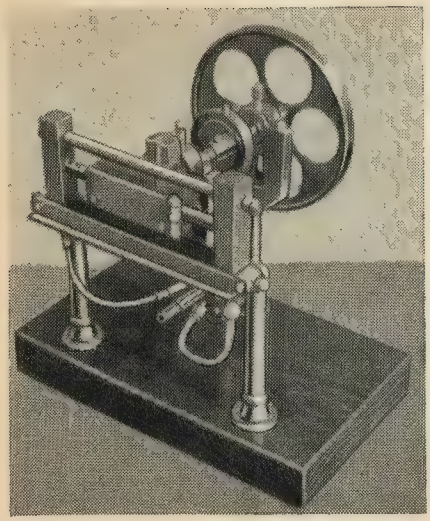
Nowadays if you leave the station when the crossing is in progress you will find the engine to be an 0-4-0 broad-gauge 202 h.p. diesel. It weighs 32 tons, and has a maximum height of 11 ft, a length over buffer of 22 ft 6 in., and a wheelbase of 6 ft 9 in., providing for a minimum curve of 80 ft. The Davey-Paxman eight-cylinder 8 RW oil engine develops a maximum power of 202 b.h.p. at the governed speed of 1,250 r.p.m.

This engine was built by Hudswell Clarke. The company has, in addition, two Hudswell Clarke steam locomotives, built in 1914 and 1919, for internal shunting on its broad-gauge sidings. Weighing 32 tons, they have cylinders of 15 in. dia. × 22 in. stroke, boilers with a tube area of 649.5 sq. ft and pressure of 175 p.s.i., and wheels of 3 ft 4 in. dia. on a 6 ft wheelbase.

I am told that the diesels have the advantages of being cleaner in service than the steam engines, of being ready for work at short notice, and of providing cover for the driver. This is doubtless true; but what other heavy-duty mechanism but a steam engine would still be capable of hard work 75 years after it was built?

During the aftermath of the Suez crisis the Eireann capital was short of fuel. The great brewery depended on its railway which links it, through the Guinness barges sailing from the private wharf to the Guinness ships down-river, with some 200 markets all over the world. Yet it was impossible to work the diesels without oil. What, then, was to be done?

All live-steamers will know the answer. The four Geoghegan engines—and what a pity it is that a locomotive is unable to chuckle—took over the working as though the year were 1882, thus proving that even in the diesel age steam can be good for Guinness! ▣



A SQUARE-PISTON STEAM ENGINE

By J. Wilson

The engineer-humorist Michael Oxley inspired Mr Wilson to build this model. And, believe it or not, it works !

HAVING been an ardent follower of the famous author Michael Oxley for some years, I decided to build a steam engine embodying some of his principles.

To prevent "interference with the free expression of ideas" I used no plans or drawings and made each piece separately and joined it on to the rest.

Piston and cylinder

First, I made a 1 in. square piston $\frac{3}{8}$ in. thick from a piece of mild steel (PB would have been a more suitable material) which was silver soldered to a 7 in. × $\frac{3}{8}$ in. square piston rod (Fig. 1). The piston rod was drilled out from each end to the piston. A cross drilling was then made through the piston rod adjacent to each side of the piston.

The cylinder was fabricated from $\frac{1}{4}$ in. m.s. plate and brazed together. A cylinder thrust bar $\frac{1}{2}$ in. × $\frac{3}{8}$ in. × 4 in. was next brazed across the cylinder (Fig. 2). Cylinder drain holes were drilled and tapped 4 BA and two 4 BA bolts replaced the normal cylinder drain cocks (no drain cocks in the scrap box). Then the eight 4 BA tappings were made at each end of the cylinder for the cylinder head studs.

Each cylinder head was made from two pieces of $\frac{1}{8}$ in. m.s. plate. A $\frac{3}{8}$ in. square hole was cut in both pieces and each piece was recessed $\frac{1}{16}$ in. round the square holes to take packing material (Fig. 3).

The cylinder and piston rod were then supported by two 1 in. square columns, each 4 in. long (Fig. 4). These were recessed 3/32 in. × $\frac{3}{8}$ in. square to take the piston rod and packing. The columns were next drilled from the base to a point level with the recessed portion of the columns. A cross drilling was made from the centre of the recessed portion to the perpendicular drilling. The base of each column was then opened out and tapped $\frac{1}{2}$ in. BSW, and the columns were located to the bed by two 1 in. Whit. bolts.

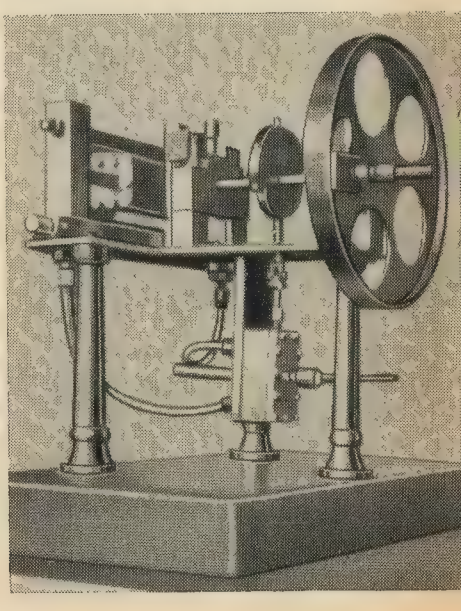
The cylinder and piston rod were then located under tension by a rod passed through drilled holes in the top of the column and suitably nutted, and two straps with adjustable end straps were located each side at the bottom.

The bed

The bed (T-shaped) 10 in. × 9 in. was made from a piece of 5 in. dia. × $\frac{1}{4}$ in. gauge pipe. This was sawn, opened up, flattened and cleaned up, the T-shape cut out, drilled for bolt holes and slotted for the eccentric strap way. Plummer blocks were fabricated from $\frac{5}{8}$ in. m.s. plate with split p.b. bearings.

The crankshaft was made from a

Top left: View of the cylinder end
Below: Flywheel end



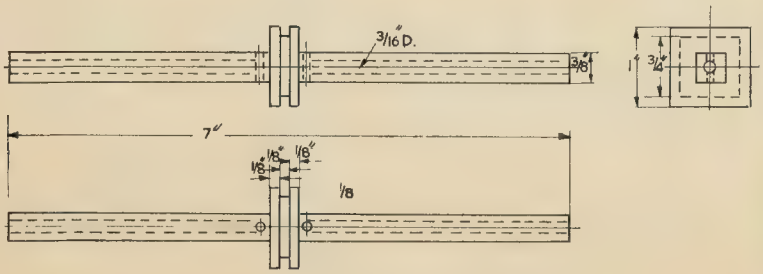
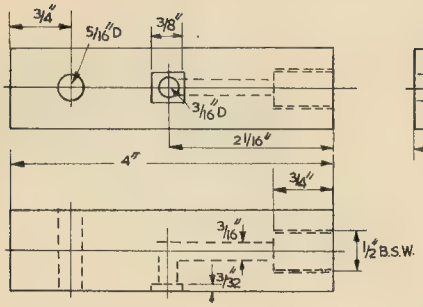
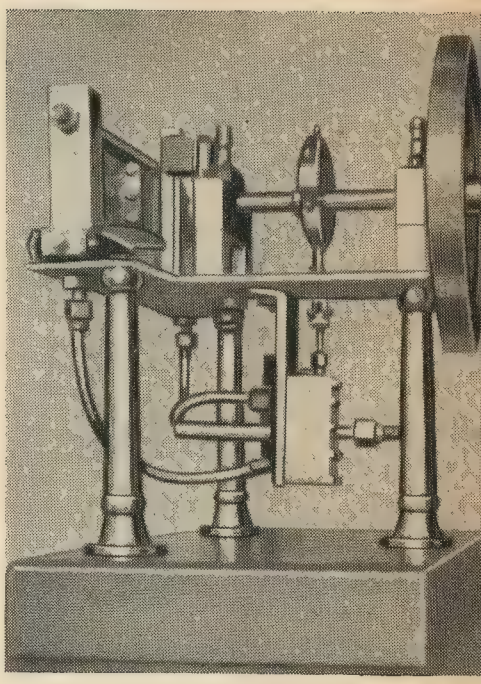


Fig. 1: The piston and piston rod



Left, Fig. 4: The columns

Right: A broadside view



piece of 7 in. × ½ in. round m.s. with the web and crankpin brazed on (throw 1 5/16 in.), the crankpin diameter being ½ in., length ½ in. The actuating thrust block (Fig. 5) was made from a 1 in. cube of p.b. suitably bored for the crank pin and slotted for the cylinder thrust bar. The eccentric strap was prefabricated from ½ in. m.s. plate, and the eccentric from a piece of 2 in. dia. p.b.

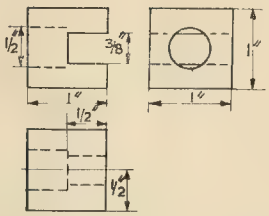


Fig. 5: Actuating thrust block

Normal valve mechanism

Normal valve mechanism was used. The valve chest was made from ¼ in. m.s. plate and brazed together. The distributor pipe connections were silver soldered at the back and the valve chest was located under the bed by means of an angle support bolted to the underside.

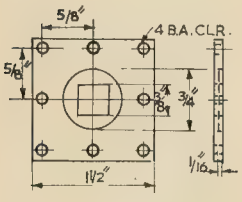
The two ½ in. Whit. bolts which locate the columns were drilled through, and suitable distributor pipe connections were silver soldered in. The distributor pipes were made from 5/16 in. copper pipe with suitable connections.

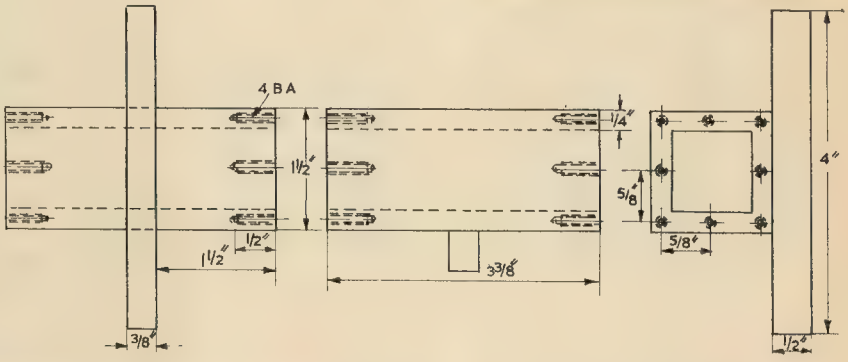
The flywheel (not really heavy enough, in my opinion) was filched from the local scrap heap where I bought my car.

The whole contraption was mounted on three columns machined out of 1¼ in. r.m.s. which were supported by a piece of 1¾ in. softwood.

The machine was built from the scrap box. The result is, I think, a true prototype. It works—on compressed air test—at approximately 50 p.s.i.

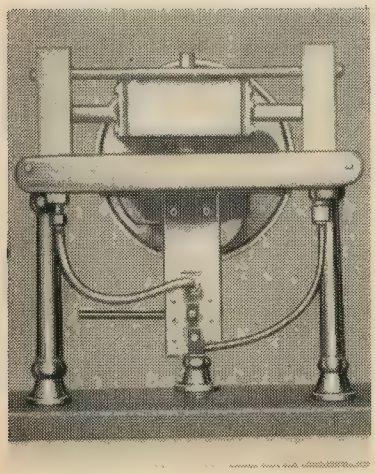
The workmanship is not of a high standard, and because of many small faults is not suitable for exhibition. But it looks very "technical"—and it was great fun building it! ▣





Above, Fig. 3: Cylinder heads. Right, Fig. 2: Cylinder and thrust bar

Below: End view



BELT DRIVES

Belt Drives in the Small Workshop by Duplex is a small useful book dealing with light transmission belts in all forms suitable for small power. It costs 3s. 6d. plus 3d. postage if ordered from the publishers, Percival Marshall and Co. Ltd, 19-20 Noel Street, London, W1 (USA and Canada $1.00).

LBSCR 2-2-2 ABERGAVENNY

By J. N. MASKELYNE

THIS engine was a considerable contrast to the magnificent *Grosvenor*. At first glance, the two engines were very similar, but *Abergavenny* was smaller and she always seemed to be more alert and lively. She was a delightful little engine and gave me a lot of pleasure.

It is a bit odd to recall that her construction took about two years and was regarded as a sort of stock job in the Brighton Works. It seems that Stroudley was carefully weighing up the feasibility of building single-wheelers for service on a line like the LBSCR; but his predecessor, J. C. Craven, had had no compunction in the matter and had provided the line with many such engines of all sizes for passenger duties all over the railway.

Abergavenny was eventually completed in January 1877 and was given the number 325; she was the only example of the original Class F. Some years later, she, with *Grosvenor*, was transferred to Class G.

In her early years, her principal job was the working of the night Continental boat train from London Bridge to Newhaven; she was consequently stationed at New Cross for the purpose, and was never seen at Wandsworth Common during the years in which she worked that particular job. This, however, was before my time.

When I knew *Abergavenny* she was stationed at Tunbridge Wells, which was her station for the last nine years of her existence. Her regular duty then was a trip to London via Three Bridges in the morning, returning on the 3.45 p.m. from Victoria via the direct line, running non-stop to Groombridge.

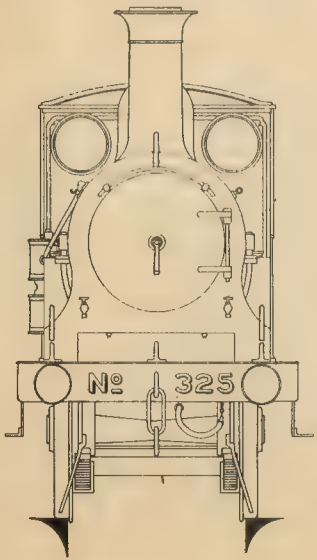
She seldom missed this turn, and when we moved to Edenbridge just before Easter 1909 she was still on it. So I was able to continue my acquaintance with a lovable little friend, though for only a short while.

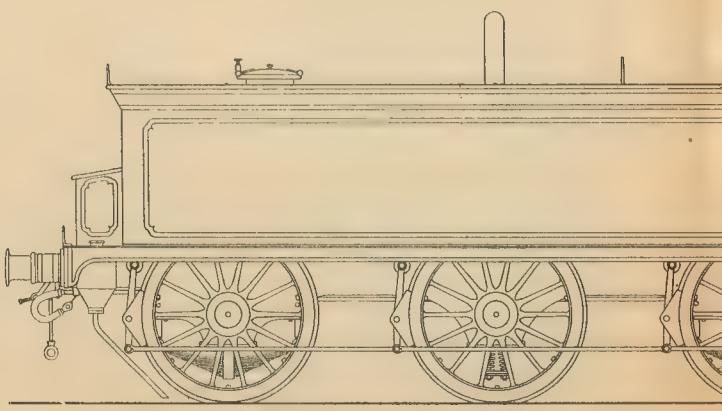
At Whitsun 1909 I saw the 3.45 *ex* Victoria pass Edenbridge Town; it was being hauled by a large 0-6-2 tank engine, No 399, *Middleton*, and I never saw *Abergavenny* again. She had been withdrawn and, I regret to add, in rather ignonimious circumstances.

It appears that during that Whitsun week, a rush of traffic had caused a shortage of engines at Tunbridge Wells shed, and one afternoon *Abergavenny*, just arrived off the 3.45 from Victoria, was immediately called upon to work a train from Tunbridge Wells to Brighton via Lewes.

This is not a road that is exactly suited to single-wheeled engines, for it has some severe gradients and awkward curves. However, after a few trying moments at certain places and hauling a load that was rather more than she could comfortably cope with, she succeeded in reaching Lewes. But the somewhat formidable Falmer Bank lay ahead, and on it *Abergavenny* stalled and could not be persuaded to go any farther.

Now it so happened that Mr D. E. Marsh, the then locomotive superintendent, was travelling by that train and, exasperated by the delays, he gave orders that *Abergavenny* was to be destroyed forthwith. So ended her gay life ! I believe that she had never before given trouble, having always worked well and punctually; so the circumstances of her end were particularly unfortunate.





TIVES I HAVE KNOWN

No 36

Abergavenny's driving wheels were originally like *Grosvenor's*, but only 6 ft 6 in. dia. They were of wrought-iron with the spokes welded into the rim and hub, and with the wrought-iron tyres shrunk on and held by setscrews placed between each alternate pair of spokes. The balance-weights had square-shaped ends. At a later date, these wheels were replaced by a cast-steel pair having crescent-shaped balanceweights, as shown in the drawing; the new tyres were of steel, shrunk on and setscrewed, as before.

The wheelbase was 8 ft plus 7 ft 9 in., and the overhang was 5 ft 8¼ in. at the front and 3 ft 5¼ in. at the back. The length of the main frames was 24 ft 10½ in. The cylinders were small, being only 16 in. dia. × 22 in. stroke. But, to judge from her general sprightliness, the engine did not find these small cylinders any serious handicap. They were horizontal, with the centres 2 ft 2 in. apart, but I have never been able to find any particulars of the ports and valve events.

The boiler was made in three rings with the dome, as usual, on the back ring; the diameter of the largest ring was 4 ft 3 in. and the length of the barrel was 10 ft 2 in. Originally, there were 202 tubes of 1¾ in. dia., giving 971 sq. ft of heating surface, but this was afterwards altered to 244 tubes of 1½ in. dia. having 1,006 sq. ft of heating surface.

The firebox heating surface was 103 sq. ft which, with the later tubing, made the total heating surface 1,109 sq. ft. The pitch of the boiler centre line was 7 ft 1½ in. above rail level.

In my time, the tender was one of the standard passenger type with inside frames, 4 ft 6 in. wheels and a 14-ft equally-divided wheelbase. An interesting feature was that this tender was lined out as one big panel instead of the usual two. I have shown this on the drawing, but nobody has ever been able to explain to me why this alteration was made, as it was done long before the adoption of the later practice of putting the initials LB & SCR on tenders.

In working order, *Abergavenny* weighed 32 tons 13 cwt, with 10 tons 9 cwt on the leading wheels, 14 tons 9 cwt on the driving wheels, and 7 tons 15 cwt on the trailing wheels.

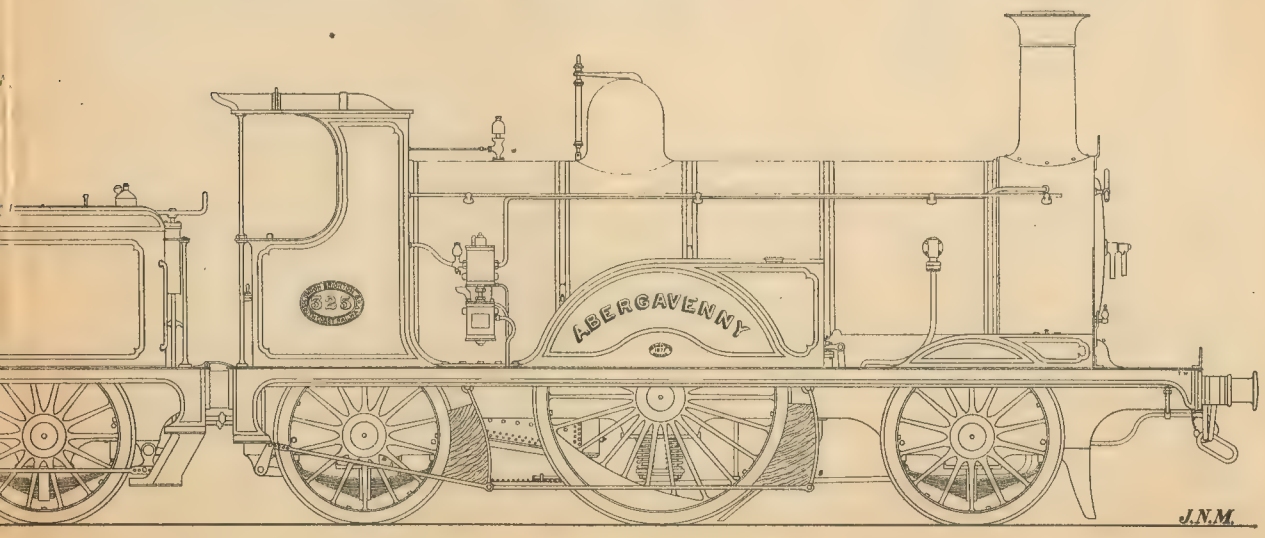
This engine retained her original brake gear, with its massive wooden blocks on driving and trailing wheels, unaltered throughout her existence; but the tender had the later standard brake rigging with cast-iron blocks.

I omitted the fact, when dealing with *Grosvenor*, that the delivery clacks were mounted each side of the boiler, on the front ring and about 18 in. to the rear of the smokebox; *Abergavenny* had exactly the same arrangement.

In the engines of the G class proper —to be dealt with in my next article— the clacks were mounted very low down on the boiler barrel and were out of sight behind the driving-wheel splashers. I raise this matter because of a certain model in one of our technical museums; it is named *Shanklin*, but has the clacks on the front ring of the boiler barrel. Its proportions suggest that its general dimensions were scaled down from the *Grosvenor!* In other words, it is a *muddle* rather than a model.

This is a pity, because the little engine, which is to ¾ in. scale, is not at all bad in other respects; even the painting is creditable—and that was not an easy feature to reproduce accurately in a small scale. I have tried it in 7 mm. to the foot and know how difficult that was.

It is of interest to recall that when *Abergavenny* was new, the tyres of her wheels were left bright and unpainted. So far as I know, this was the only instance of the kind on the LBSCR, and there does not appear to have been any particular reason for it. When I knew the engine, however, the wheels were painted in the normal style, with black tyres. ▣



ZOE

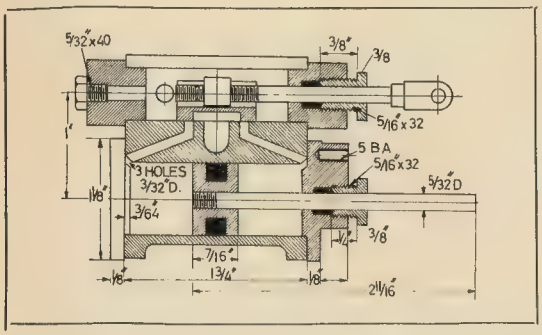
In this instalment LBSC describes the cylinders and pistons for the 1¾ in. gauge passenger hauling locomotive

Continued from 20 June 1957, pages 894 to 896

THE cylinders described below would come as a shock to designers of the old school who considered that a bore of $\frac{7}{16}$ in. was about the absolute limit for a 1¾ in. gauge engine, but we have learned a lot since those days.

To avoid much fresh pattern-making which adds to the cost of castings—expensive enough in these days, goodness only knows !—I have utilised the cylinders specified for *Tich*, for which castings are already available.

The distance from frame to centre of cylinder on that engine is $\frac{7}{8}$ in., but if the castings won't clean up on the bolting-face to the 1 in. specified for *Zoe*, just machine them up to $\frac{7}{8}$ in. and put a make-up piece $\frac{1}{8}$ in. thick between the bolting-face and frame when erecting. If desired, this can be made from red fibre as a heat insulator, but the gain in efficiency will probably be too small to be noticeable.



Cross section of the cylinder and piston

The easiest way to set up the castings for boring is to mount them on an angle plate attached to the face plate, holding firmly by a bar across the back of the casting with a bolt at each end. If the cored hole runs reasonably true, no marking-out is necessary; but if obviously out of truth with the body, smooth off the end of the casting with a file, plug the end of the cored hole with a stub of wood, mark the centre of the flange on it, and strike the outline of the bore from that with a pair of dividers.

Smooth off the portface with a file and bolt the casting, portface down, to the angle plate with about $\frac{1}{8}$ in. overhanging the edge. To set the casting in line with the lathe centres, apply a try square to it, stock to face plate and blade to bolting-face. Tighten the clamping bolts, then adjust the angle plate on the face plate until the cored hole, or marked circle, runs truly, testing with a scribing-block standing on the saddle or lathe bed. Then tighten bolts holding angle plate to face plate.

Face off the flange with a roundnose tool set crosswise in the rest, taking off half the difference between length of casting and the length of the finished cylinder. Next mount a boring tool in the rest, and bore out the cored hole to a shade under $\frac{11}{16}$ in. dia., taking a good hefty first cut to shift the hard skin.

If an $\frac{11}{16}$ in. parallel reamer is available, bore until the "lead" end of the reamer will just enter. If not, regrind the tool (the removal of the hard skin on the casting will probably have removed the sharp edge of the tool as well) and bore to finished diameter, using a very fine feed.

A stub of $\frac{11}{16}$ in. round rod makes as good a gauge as anything; just bore until the hole will allow the gauge to slide in easily. The inside jaws of an ordinary slide gauge can also be used.

If using a reamer to finish, put a tapwrench on the shank, hold the reamer against the tail-stock centre, push up the tail-stock and enter the lead end in the cylinder bore, then slide the tail-stock bodily along the bed until the reamer goes in as far as possible, only stopping to reverse and draw it back. If the reamer is stopped either on the in or out movement, the chances are that there will be ring marks in the bore.

Before using the reamer, run your fingernail along the edges. If you feel any nicks, give the edges a rub on the oilstone. If the casting is too close to the face plate to allow of reaming, bore until the lead end of the reamer will just enter, as before, then dismount the casting, put it in the bench vice, and put the reamer through by hand, with a tapwrench on the shank.

A spot of cutting oil on the flutes will help to produce a smooth bore. It doesn't matter about stopping when reaming by hand, as the casting isn't revolving. You have to change hands on the tapwrench, anyway. Take care to avoid bearing on it either up or down, or the bore will be either taper or bell-mounted.

Setting the top slide

Tip to beginners—most small lathes now on the market have a sliding saddle operated either by a self-acting feed, or by a handle on the end of the feed screw, and if the lathe is reasonably accurate, the bore will be true within the usual limits. If your lathe is one of the older type without a sliding saddle, the top slide must be set true before starting to bore.

This is easy enough. Chuck a piece of round rod in the three-jaw with about 2 in. projecting, and take a fine cut along it with an ordinary roundnose tool. Test at each end of the cut with a micrometer or callipers. If the "mike" reading only shows a variation of 0.005 in. or less, the slide is O.K. for boring. Same applies if you can detect no difference worth speaking about in the feel of the callipers when applied at either end. If there is a difference in either feel or reading, adjust the slide and have another go. Three shots at the outside, usually does the trick.

To face the other flange, chuck a piece of ¾ in. round rod in the three-jaw and turn down about an inch of it to a tight fit in the cylinder bore. If the cylinder is pushed on to this, it is only a few minutes' work to face off the flange to correct length, and the flange will be dead square with the bore.

FACING FLAT SURFACES

Although I have a milling-machine I find it quicker to up-end the cylinder castings on the angle plate attached

to the lathe face plate, and machine off the portface and bolting-face with a roundnose tool set crosswise in the rest.

Set the casting on the angle plate with a bolt through the bore, and put a big washer under the nut. Between casting and washer, and under the casting, put pieces of soft metal, copper or brass, to prevent marking the machined flanges. First set the portface true by applying a try square, stock to face plate and blade to bolting-face. Machine off until the portface is 13/32 in. from edge of bore, then slew the casting around a quarter-turn, setting with the blade of the try square to the machined face; this will bring the bolting-face right for operation.

If the casting will allow it, face off until the bolting-face is 21/32 in. from the edge of the bore; the cylinder can then be erected in due course without any packing piece. If it won't clean up to that, machine off to within 17/32 in. of bore, and use packing when erecting, as mentioned in the first paragraph.

Another beginners' tip—never let the lathe vibrate when boring or facing cylinders. Bolt a weight to the face plate (I use tin lids filled with lead) opposite the angle plate when setting up for boring. It is merely a matter of trial and error to adjust the weight to obtain correct balance. When on the facing job, the angle plate can be adjusted centrally with the face plate, and no weight is needed.

PORT AND PASSAGEWAYS

On the portface, mark out the ports as shown and cut them either by end milling or by drilling and hand chipping. I don't recommend gang milling for the simple reason that all you get are three shallow round-bottomed grooves, like Woodruff key-seats, and unless they are deepened there is considerable risk of breaking through into the portface when drilling the passages.

My correspondence has told many a tale of woe! For end milling, I find that home-made slotting cutters, made as I have described in previous notes, do the job far more readily than commercial end mills. Hold one of the right size in the chuck, and if a vertical slide is available, bolt the casting to it, portface outwards, in the same way as set up for machining the face. Feed on to the cutter with the top slide, and traverse across with the cross slide, adjusting the vertical slide to bring the port marking level with the cutter.

If a vertical slide isn't available, the casting can be set up on the top slide or saddle, with suitable packing to bring the port markings level with the cutter. Incidentally there is no need to make a $\frac{1}{4}$ in. cutter especially for the exhaust ports, as they can be cut with the steam-port cutter by taking three bites, each slightly overlapping. Note that rounded ends to the ports do not affect the working of the engine in the slightest.

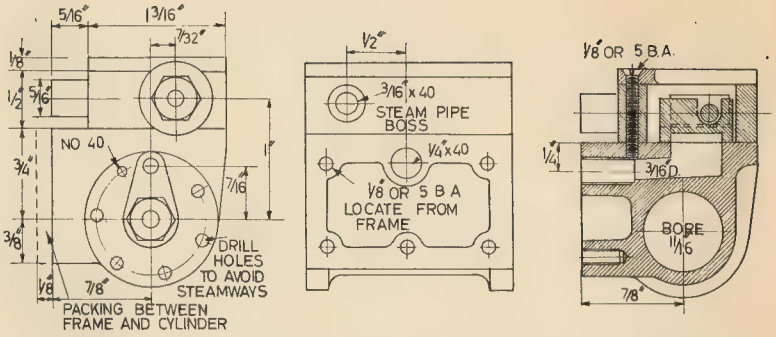
To cut the ports by hand, drill holes in the marked-out spaces about $\frac{1}{4}$ in. deep, and chip the edges square and straight with little chisels filed up from 3/32 in. and $\frac{1}{8}$ in. silver steel, hardened and tempered to dark yellow, and finished off on an oilstone. An ordinary one $\frac{7}{16}$ in. wide will do the long edges of each port at one fell swoop.

For the passages, file a bevel in the lip of the bore at the place shown in the drawing, make three centrepops on it $\frac{1}{8}$ in. apart, put the casting in a machine vice on the drilling-machine table at such an angle that the drill will go into the port—and be mighty careful as the drill breaks through, or there will be another break, and little drills are expensive nowadays.

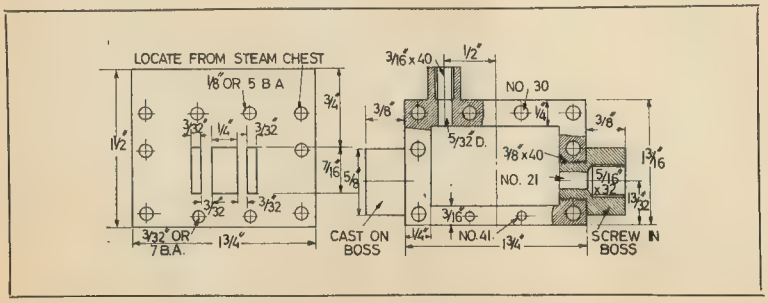
The angle at which the casting should be set is easily seen by running the drill down outside the casting. Grind the drill a wee bit off-centre, so that it cuts a hole larger than its own diameter. Then if it clogs and breaks, the bits can be shaken out and the casting saved.

If drilling by hand, set the casting in the bench vice at such an angle that the drill brace can be held horizontally, taking the same strict caution as before when the drill breaks through into the port.

When drilling the exhaust way, first drill and tap the hole in the bolting-face at right angles to same as shown. Then put the $\frac{3}{16}$ in. drill down the hole at an angle, and drill into the exhaust port.



Back end of the right-hand cylinder, bolting-face of right-hand cylinder and section through exhaust port



Cylinder portface and steam chest

PISTON AND COVERS

Cut two $2\frac{3}{4}$ in. lengths of 5/32 in. rustless steel, face off both ends to overall length of $2\frac{11}{16}$ in. and put a bare $\frac{1}{4}$ in. of 5/32 in. × 40 thread on one end of each. Chuck a piece of $\frac{3}{4}$ in. round bronze in the three-jaw, face, centre and drill to $\frac{1}{2}$ in. depth with No 30 drill. Run a parting tool in for about $\frac{1}{8}$ in. at $\frac{7}{16}$ in. from the end, then in the middle of the space cut a groove with the parting tool $\frac{9}{16}$ in. wide and 7/32 in. deep. Turn the outside to a shade over $\frac{11}{16}$ in. dia. so that it is just too big to enter the cylinder bore, and part off; repeat process.

Chuck one blank in the three-jaw, open out the hole with a No 22 drill for $\frac{3}{16}$ in. depth, and tap the rest 5/32 in. × 40. Put a piston rod in the tailstock chuck, bring it up to the blank, enter it in the hole and pull the belt

by hand until right home, with the rod flush with the other end of the blank.

Serve No 2 with a dose of the same physic, then chuck the rod either in a collet or a split bush in the three-jaw and carefully turn the piston to an exact sliding fit in the cylinder bore. It should just slide without the least sign of shake. I have described many times how to make true split bushes for jobs like this.

The front covers are plain turning jobs; just chuck by the stub provided, turn to diameter, and face off, turning the register to a tight fit in the bore. The back covers are chucked and the diameter turned likewise, then face off the gland boss, centre, drill through with No 21 drill, open out to 11/32 in. depth with letter J or 9/32 in. drill and tap $\frac{5}{16}$ in. × 32.

The best way of holding the covers for this job is in a stepped bush also previously described, but they can be held in the three-jaw by the edges if the chuck is reasonably true. Note, it is essential that the hole for the piston rod should be absolutely true with the register, otherwise the piston will bind.

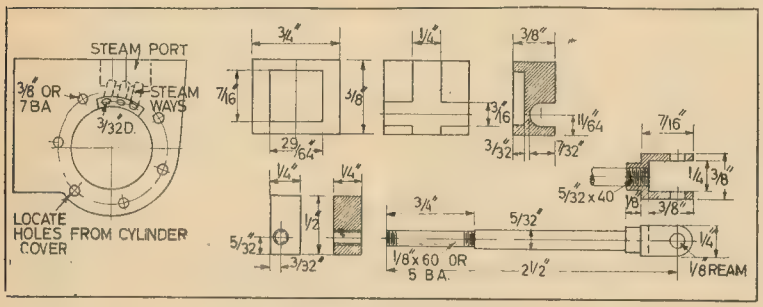
as shown in the drawings, arranging them to miss the bevel where the passageways come out.

If the jig is clamped to each cover over the register, it is only a few minutes' work to drill all the holes, but be sure to set the jig on the back covers in correct relation to the gland bosses, as shown in the drawings. Each cover is then put in place on the cylinder, the No 40 drill put through the holes to make countersinks on the flanges, the countersinks drilled No 48 either on drilling-machine or lathe (*not* by hand on any account) and the holes tapped 3/32 in. or 7 B.A.

To locate and drill the hole for the guide bar correctly, temporarily attach the back cover to the cylinder, then lay it bolting-face downwards on the lathe bed or something equally flat and true. Set the needle of a scribing block to the middle of the piston-rod hole (I put a dummy plug in it with the true centre marked on the plug) and scribe a line along the boss. Make a centrepop on this line at $\frac{7}{16}$ in. from the middle of the piston-rod hole, drill it No 40 on the drilling machine or lathe without removing the cover from cylinder, and tap $\frac{1}{8}$ in. or 5 BA.

STEAM CHESTS

If the bosses are cast on the steam chests, the contact faces will have to be milled or filed true, but if separate screwed-in bosses are used, the contact



Slide valve and spindle

One way of ensuring this is to chuck a short bit of rod and turn $\frac{1}{4}$ in. of it to $\frac{5}{16}$ in. dia. screwing 5/32 in. × 32, facing the shoulder truly. Screw the gland boss on to this, seeing that it butts up tightly against the shoulder and that the cover runs truly; then turn the register to a tight fit in the cylinder bore, and face off to 3/64 in. width as shown.

Drill the screwholes in the covers by aid of a simple jig made from a steel washer not less than $1\frac{1}{8}$ in. dia. Chuck it and bore out the hole until it just fits the registers on the covers, then set out and drill the six screwholes

faces can be faced off with the steam chest held in the four-jaw. The outsides are just cleaned up with a file. To drill and tap cast-on bosses, chuck one in three-jaw and set the other to run truly as possible; centre it with a size E centre drill and bring up the tail-stock centre to support it while the outside is turned and the end of the steam chest faced off.

Then shift the tail-stock away, run a No 21 drill through the boss, open out to $\frac{7}{16}$ in. depth with letter J or 9/32 in. drill and tap $\frac{5}{16}$ in. × 32. Reverse in chuck and repeat operation, but this time drill No 30 and tap 5/32 in. × 40, for a plug as shown. This is handy for squirting a shot of cylinder oil in when starting from cold after a long stand, also for an occasional dose of colloidal graphite, which would choke the mechanical lubricator if mixed with the oil in that.

For screwed-in bosses, mark off to dimensions shown, and drill the holes with letter R or 11/32 in. drill, tapping $\frac{3}{8}$ in. × 40. Chuck a piece of $\frac{5}{8}$ in. round rod, face, centre, drill to $\frac{3}{4}$ in. depth with No 21 drill, open out to $\frac{5}{16}$ in. depth with letter J or 9/32 in. drill and tap $\frac{5}{16}$ in. × 32. Part off at $\frac{5}{8}$ in. from the end, reverse in chuck, turn $\frac{1}{4}$ in. length to $\frac{3}{8}$ in. dia. and screw $\frac{3}{8}$ in. × 40. Screw home in steam chest with a smear of plumbers' jointing on the threads.

The glands for the steam chest and piston are turned from $\frac{3}{8}$ in. hexagon bronze rod to dimensions shown and need no detailing; note, the threads must *not* be slack on any account. The steam chest cover is a piece of $\frac{1}{8}$ in. brass plate the same size as the steam chest.

After drilling the holes in the chest, clamp the cover to it and drill the holes in that, using the chest as a jig. Then clamp the chest to the cylinder portface, run the drill through the holes and make countersinks on the portface, remove the chest and drill and tap the screwholes at the countersinks as shown. Finally drill the steam pipe boss at the side, and tap it for the steam pipe.

SLIDE VALVE AND SPINDLE

The slide valves are blocks of gunmetal or bronze cut to exact sizes shown. The cavity can be end milled, or cut by hand like the ports. The slot for the nut can be cut by holding the block at correct height in a machine vice on the lathe saddle and traversing it under a $\frac{1}{4}$ in. cutter on an arbor between centres, or it may be end milled. The slot for spindle can easily be formed by drilling a $\frac{3}{16}$ in. hole lengthwise through the block, and sawing and filing away the top part to form the round-bottomed groove.

The nut is a $\frac{1}{2}$ in. length of $\frac{1}{4}$ in. square rod with the hole for spindle drilled and tapped as shown. The spindle and fork need no detailing, the fork being made in the same way as valve-gear forks previously described, from $\frac{3}{8}$ in. × $\frac{1}{4}$ in. steel; but note that the jaws are of extra width, as when the valve gear is erected, the top of the combination lever fits between them.

The cylinders for the double-size $3\frac{1}{2}$ in. gauge *Zoe* will be of a little different pattern, and all being well I will deal with them later.

● *To be continued*

RUST and the HOME WORKSHOP

J. H. B. RAW offers a few suggestions for combating this enemy

KEEPING tools and equipment free from rust—particularly in the winter—is one of the major problems facing the model engineer. The ideal state of affairs is to have a heated workshop kept at constant and fairly high temperature. Few can enjoy such luxury, however, so alternatives have to be found.

Rust on iron and steel occurs principally in the presence of moisture, and a condensation of moisture forms most rapidly when there are sudden

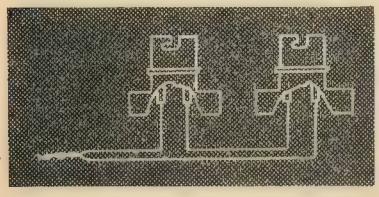


Fig. 1: *Series connection for two lamps*

changes of temperature. A sudden change from cool to mild weather can cause condensation on almost anything, but it is particularly heavy on metal. In the same way, attempts to heat a workshop quickly in order to produce a comfortable working temperature will cause condensation on all metal equipment until the temperature of the equipment approaches that of the surrounding air.

This is not the full story, as relative humidities and dew points come into the picture but the foregoing will, I feel, cover most of the contingencies that may face model engineers.

Apart from coating everything with oil, there are three good methods of keeping equipment free from rust. *1* by extraction of moisture from the surrounding air. *2* by provision of vapour inhibitors. *3* by application of local heat.

A lathe is as good an example of equipment as any to be kept free from rust. A cover is essential; even an old tablecloth is better than nothing, and a plastic bag cut roughly to shape is better still. But best of all is a cover made of plywood or some of the manufactured boards. Your cover should be made to fit as snugly as possible, as it will keep out damp and slow down any sudden changes of temperature in the immediate vicinity of the machine.

In order to absorb damp in the enclosure, a substance known as silica gel can be used. This will absorb large amounts of moisture and still retain its granular form without becoming sticky or wet. When it is suspected that its moisture-absorbing properties are reduced (shown by a weight increase of about 25 per cent) it is only necessary to heat the silica gel in an oven to a temperature of about 300 deg. F to drive off the moisture, and it is then ready for use again. A small bag of 1 lb. or so is ample to look after the space inside the cover over the average 3½ in. lathe for a considerable period. If, owing to lathe usage, the cover is removed at frequent intervals, the silica gel will have to be heated up more frequently.

There is a more modern method of preventing rust by the use of substances known as vapour phase inhibitors. These can be used in the form of liquid, powder or prepared paper, and anyone interested in the subject can find details in the British Standard Packaging Code.

The liquid forms of inhibitor are intended more for preservation during extended storage, and need to be removed by petrol or white spirit. The powder form can be kept in an open tin near the equipment to be kept rust-free. But probably the most convenient form is that of prepared paper. This can be bought in packets from Williams-Cook Ltd, Brunel Road, East Acton, London, W3.

It is claimed that this paper gives rust protection on any iron or steel surface within 12 in. of the paper—provided there are no draughts to disturb the vapour given off by the paper. In the type of enclosure mentioned, the paper should give protection for a considerable period, but since the paper provides protection by slowly giving off a vapour its useful life depends on the frequency with which the vapour is blown away by draughts or by disturbing the cover.

The advantage of this paper is that it can be cut into suitable shapes for tool boxes, lathe covers, micrometer boxes, etc. For the average small workshop one five-shilling packet should last through the winter.

The application of local heat to small items in the workshop is more difficult to arrange than the two methods already described, but it is probably the most satisfactory way to keep a lathe in good condition. In this particular case of applying heat, cloth or plastic is not recommended. The cover should be as airtight as possible, and although it may be necessary to cut slits in the cover to fit over belts or electrical connections, a little ingenuity should show some method of closing such slits when the cover is in place.

The heat can be provided in the very simple form of electric lamps. As any one lamp of the modern gas-filled type develops too high a temperature to be safe, it is far better to use two lamps connected in series (Fig. 1). The temperature of each

● *Continued on page* 943

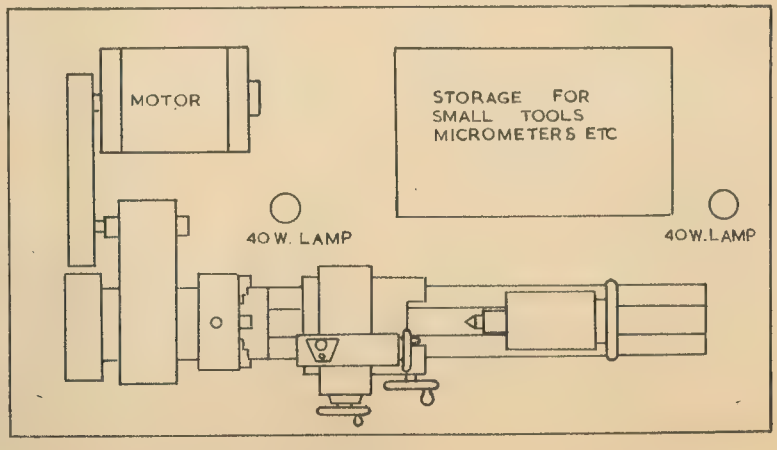
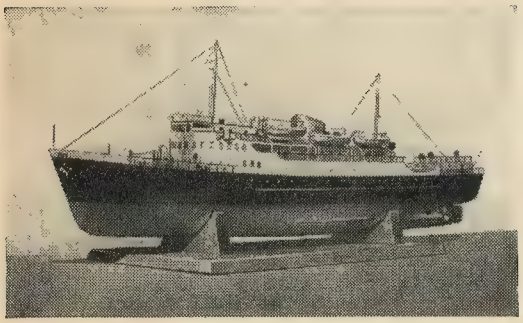


Fig. 2: *Suggested arrangement under cover of a* 3½ *in. lathe*



A WORKING MODEL OF ST NINIAN

By EDWARD BOWNESS

Part 13—This article deals with the final details of the forward shelter deck and discusses various problems connected with the windlass and the anchor cables

(*Continued from 13 June 1957, pages 844 to 846*)

HAVING completed the main body of the superstructure the forward shelter deck should now receive attention. Preparations for this were described in part 5 (March 7). At that time I visualised soldering down this deck and making it a fixture, but for various reasons it will be preferable to screw it down, making a watertight joint but so arranged that it can be lifted should occasion arise.

FORWARD SHELTER DECK

The general layout of this deck is shown in Fig. 63, which gives the position of the more important fittings and shows also the run of the planking. The position of the forward deck crane is indicated but the crane itself will be described later.

Since the deck is to be removable, it must be extended right aft to meet the curved front of the midship superstructure. It will thus overlap the flat plate which was soldered on top of the forward bulkhead, Figs 22 and 23 (March 7). As this flat plate is made from tinplate there will be no perceptible step.

The deck plate should be made of 0.012 in. tinplate, the actual shape being taken from the model. It should have an overlap of $\frac{1}{8}$ in. along the edge of the side angles. Aft it will fit closely around the curved front of the superstructure, and forward it will extend 0.4 in. beyond station 10, at which point it is cut square across.

The camber of the deck will be determined aft by the bulkhead at station 8, but to maintain the camber throughout, an additional stiffener should be soldered to the underside of the deck plate at station 9 as shown in Fig. 63. This should be made from 16 s.w.g. sheet brass of such a length as to fit between the flanges of the stiffening angles. It should be about $\frac{1}{2}$ in. deep at the centre and the ends radiused as shown in Fig. 31 (March 21), which shows the corresponding stiffener under the after shelter deck plate.

The hatch is a dummy similar to those on the after shelter deck, which were described in part 6 (March 21). It is surrounded by a 5/32 in. square hardwood strip, which should be cemented to the deck as already suggested. It may be a good idea to put in a few tiny brass screws from the underside for additional security. These could have round heads as they are not seen in the finished model.

Inside the wooden framing there will be a tinplate strip and inside the strip the hatch cover boards, 20 in number, arranged as shown in Fig. 63. A detailed description for making the hatches and their boards was given in part 6, and Fig. 31 in that article shows a section through the hatch. These should be referred to for the forward hatch.

The only material difference is that whereas in the after hatch the rail stanchions carried a wooden handrail, in the forward hatch there were only the two rods and no wooden handrail. The stanchions will, therefore, be made as shown in Fig. 51 *D*, but with the upper part cut away above the second ball and rounded off smoothly.

ANCHOR WINDLASS

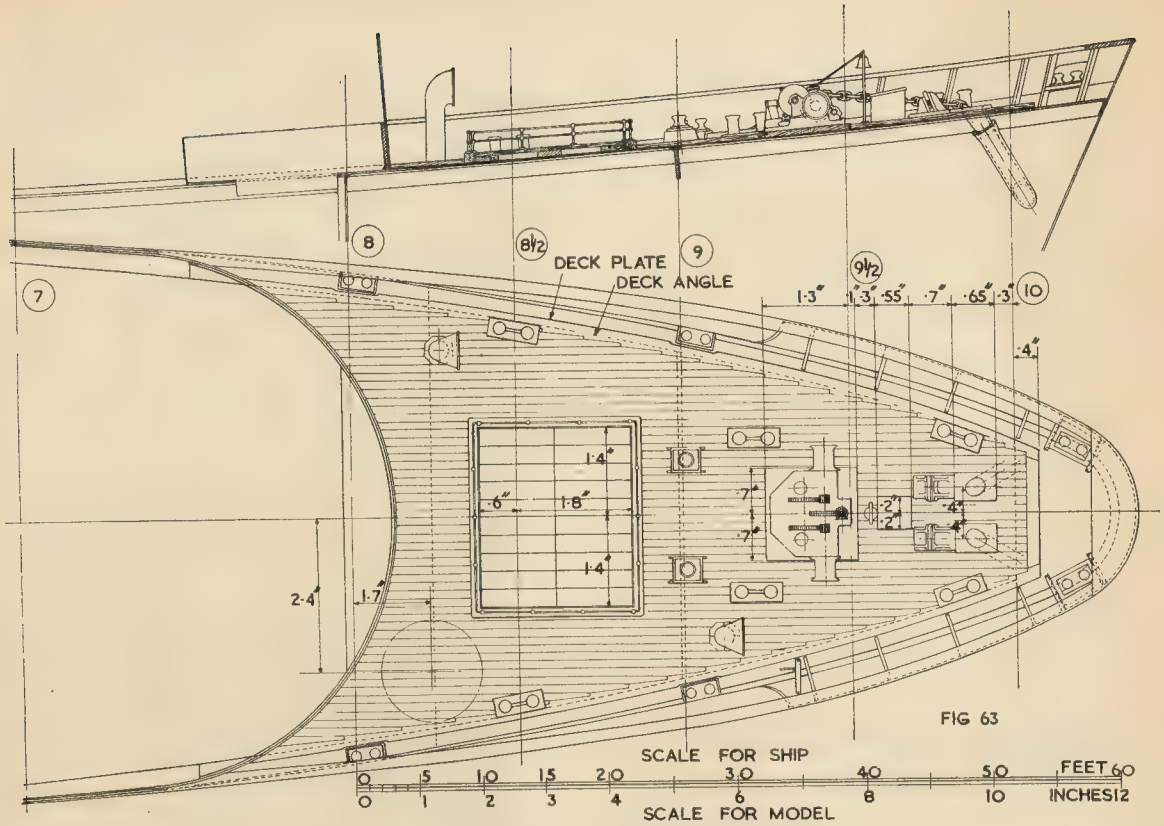
The most prominent and, from the modelmaker's point of view, the most interesting feature of the forward shelter deck is the anchor windlass. In *St Ninian* an electric windlass is fitted. This was supplied by the well-known Gateshead firm of Clarke, Chapman and Co. Ltd, who have been most helpful in providing information.

I suggest that for a model of this scale the windlass should not be a working model, as the parts would be too fragile for the pondside. The radio control enthusiast would probably prefer to make a windlass which works, even though it may not bear any great resemblance to the one on the ship herself, but my preference is for a windlass which looks like the real thing and adds to, rather than detracts from, the nautical trim of the model.

The drawing, Fig. 64, shows the general features of the windlass actually fitted on *St Ninian*. The electric motor which drives it is bolted down to the deck below, and drives a vertical shaft by means of a worm and wheel. This shaft drives the first motion shaft of the windlass through a pair of mitre bevel wheels and a dog clutch. A pinion connected to the dog clutch drives a large gear on the second motion shaft on each end of which is keyed a warping drum.

Pinions are keyed on each side of the central gear wheel which engage with the large gears on the gypsy or cable lifter shafts. Each cable lifter has its own shaft so that it can be operated independently of the others. The gears are connected with the cable lifters by means of a clutch, the clutches being operated by means of the screws with L-shaped handles

Fo'c'sle head from bridge, with jib of crane in foreground



General layout of forward shelter deck

mounted on pedestals on the after side of the windlass.

The outer flange of each of the cable lifters forms a narrow brake drum of large diameter carrying brake bands which are anchored to the baseplate, and are operated by a long shaft which projects aft on each side. The cable lifters are large heavy drums or discs with recesses into which the links of the cables fit in such a way that they cannot slip.

To lift the anchors the drums are driven through the gears. It is obvious that for the maximum lifting effort they must be operated independently. To let go the anchor, the clutch in the cable lifter is released while the brake is full on, after which the brake can be eased off gradually so that at no time does the anchor get out of control.

Two heavily flanged holes are cast in the bed plate, situated below the after side of the cable lifters, so that the cable will fall easily into the chain locker below. Forward, the cables pass through the cable stoppers and into the hawse pipes, and so to the anchors.

MAKING THE WINDLASS

To make the windlass for the model is quite a problem. There are a number of model windlasses on the market, but it is extremely unlikely that any one of them will be of the type or of the scale to suit the model. So the only alternative seems to be to make one. The original drawing for Fig. 64 is made to the scale of 2/5 in. to 1 ft, or twice the size required for the model. This will be included in the drawings published in the Percival Marshall Plans Service. In the magazine it has been reproduced the actual size for the model so that, in making it, measurements may be taken direct.

The method adopted in making the windlass depends entirely on the skill and preferences of the builder. The chief difficulty would appear to be in the bed plate. This could be fabricated in metal, the bearings and the raised faces for them being built on to a base plate of heavy sheet brass. It should be possible to obtain a pair of mitre wheels for the primary drive, and suitable spur wheels and pinions for the other drives should not be too difficult to find. The ribs or spokes in the warping drums could be fitted after turning the drums, or at this scale may be omitted altogether.

It will be noted that all the bearings are inclined at 45 deg., those on the first and second motion shafts being inclined forward, and those for the third motion shafts for the gypsys inclined aft. The ribbed brackets for the screws, which operate the clutches on these shafts, could be made solid.

Various methods for making the gypsys have been described from time to time, the usual method being to make the halves separate, which facilitates greatly the cutting out of the recesses for the links of the chain. Bosses for the brake bands could be soldered on, and the links and bell-crank levers cut out of thin sheet metal, using wire for the operating screws and their handles.

The complete windlass should be mounted on a piece of close-grained hardwood, such as boxwood or walnut. It is 1.4 in. wide × 1.3 in. long and about ⅛ in. thick, flat on its upper surface and with its lower surface fitted to the camber of the deck.

The anchor cables should be shown in position, coming up through the holes in the bed plate of the windlass over the gypsys, forward through the cable stoppers and down the hawse pipes, where they are shackled to the anchors. The links of the chain should be approximately ¼ in. long and they should be made of 20 s.w.g. wire. If

the chain is purchased and has no studs, these should be added. They can be sweated in position quite easily. It may be possible to purchase suitable anchors but if not they are not difficult to make. Their general form was indicated in the general arrangement on page 96 (January 17).

Two thin brass tubes of $\frac{1}{4}$ in. or $\frac{3}{16}$ in. dia. and about 2 in. long must be soldered into the holes in the bed plate of the windlass to receive the inboard ends of the cables. The lower ends of the tubes must be sealed to prevent water getting into the hull.

The hawse pipes should be made from stout brass tube $\frac{5}{16}$ in. o.d. They must project about $\frac{1}{16}$ in. beyond the outside of the hull plating, the ends being bevelled to suit the shape of the hull. It might be advisable to reinforce the plating on the inside to make a firmer job. There are no recesses for the anchors in *St Ninian* but the fillet of solder and the projecting ends of the tubes should be rounded and shaped with a file so as to form a smooth oval flange.

When soldering the tubes in position the inner and upper ends should be held firmly by means of a block of wood wedged in the bows of the ship. Two holes to receive the ends of the tubes should be drilled on the underside of this block in such a position that the tubes will line up with the stubs in the deck plate.

From Fig. 63 it will be seen that the tubes terminate about $\frac{1}{4}$ in. below the deck and that they have been expanded before fitting, to receive the stubs. The stubs in the deck plate are made from short tubes about $\frac{3}{4}$ in. long with their lower ends tapered to enter the ends of the hawse pipes, and their upper ends flanged so that they will lie in the tube plate at the correct angle. They must be soldered firmly in the deck plate, with their lower ends of sufficient length to make a reasonably watertight joint in the hawse pipes.

CABLE STOPPERS

These are sometimes called bow stoppers, but their function is to prevent the cable running out at the wrong time. For this purpose a heavy casting is provided in the form of a gate or passage through which the cable runs. A hinged plate which fits over the cable and between two of the links is thrown across the cable and, being firmly supported by the gate, it prevents the cable passing through.

● *To be continued*

Close-up of windlass

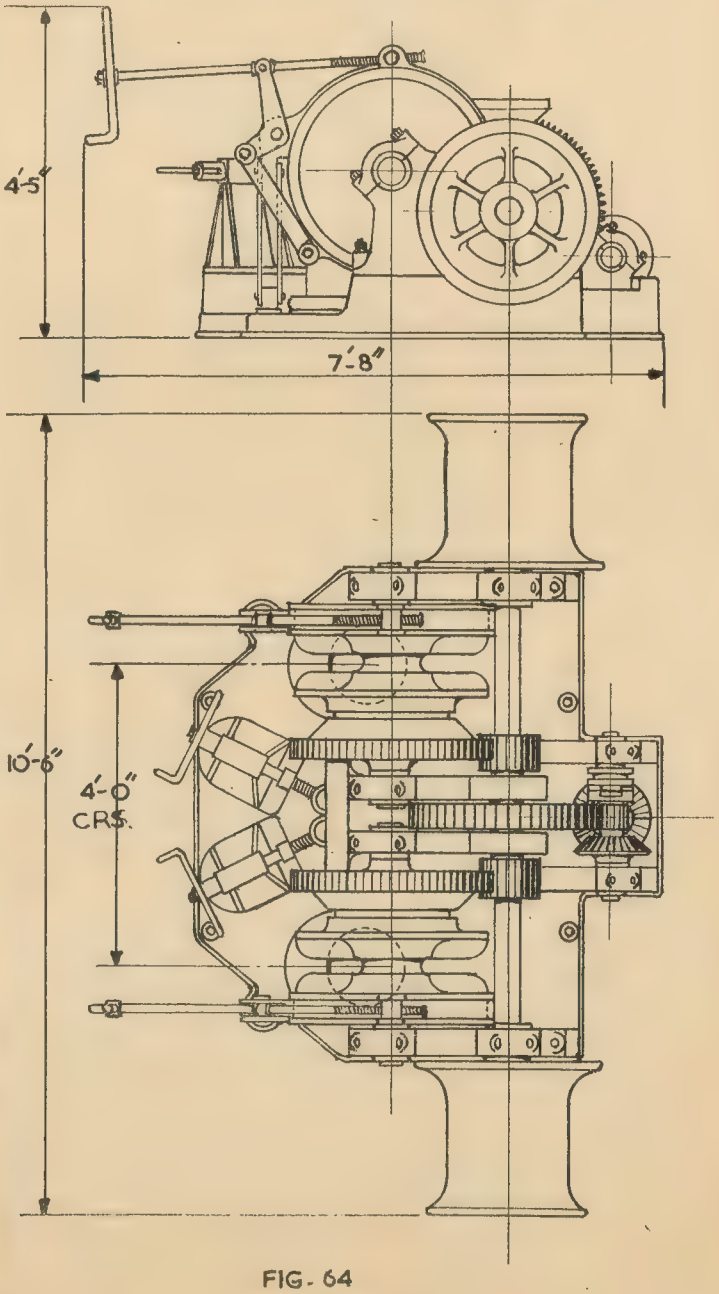


FIG. 64

Drawing showing anchor windlass for ST NINIAN

A MULTI-GAUGE PORTABLE TRACK

Which, being interpreted, is the Wakefield way of making it pay!

THE Wakefield SMEE was formed in 1951 by a few local enthusiasts who soon found out that to run a club successfully money was required. Members' subscriptions were not enough, so to help the club develop it was proposed to build a portable track and to operate it at local galas and fetes. At the time the club was less than six months old and had only two locomotives, neither of which was very large.

As one of the members was a draughtsman, it was decided to give him a free hand in the design of the track, bearing in mind three points: as far as possible bedstead angle iron must be employed, it must be simple and, above all else, no nuts and bolts must be used in its erection. The draughtsman got to work and produced a very good design for a track which could accommodate 2½ in., 3½ in. and 5 in. gauge locomotives.

The design allowed for all the stands to be made from angle iron of all-welded construction, and the track sections to use angle iron for the 5 in. gauge rails with angle iron spacers carrying $\frac{5}{16}$ in. square steel bar for the 2½ in. and 3½ in. gauge rails. (This can be seen in the drawing.) The most important thing about this design was that it used dowels and corresponding holes for the erection of the track instead of the usual and more general use of nuts and bolts—and the dowels which mate up with corresponding holes in the other end of the next section ensure complete sideways alignment of the rails.

To lock the two sections together and locate the stands, a dowel runs crossways through the sides of the angle in each end of the track, and these dowels locate in corresponding slots in the stands. In the original design provision was made for stays in between stands and sections, but on the first erection of the track it was found that these were not necessary for it proved quite rigid and stable without.

While this design was being conceived, two members with cars were busy touring scrapyards in the neighbourhood purchasing as many bed angle irons as possible and distributing them to members' workshops. At first the price of these ranged from 3d. to 6d., but as soon as the merchants realised the demand their prices rose and eventually the society was paying 9d. apiece. But as the club was getting about 5 ft 9 in. of 1¾ in. angle iron out of these lengths the price was not too bad.

Eventually construction was started. Special jigs were made for the correct spacing of the section end-holes and dowels and also for holding the spacers and rails in their correct places while being welded. The first snag was when it came to welding—and this only on a financial point. The first section was welded by a local engineer and proved rather expensive, and so for a time it looked as though things would come to a stop.

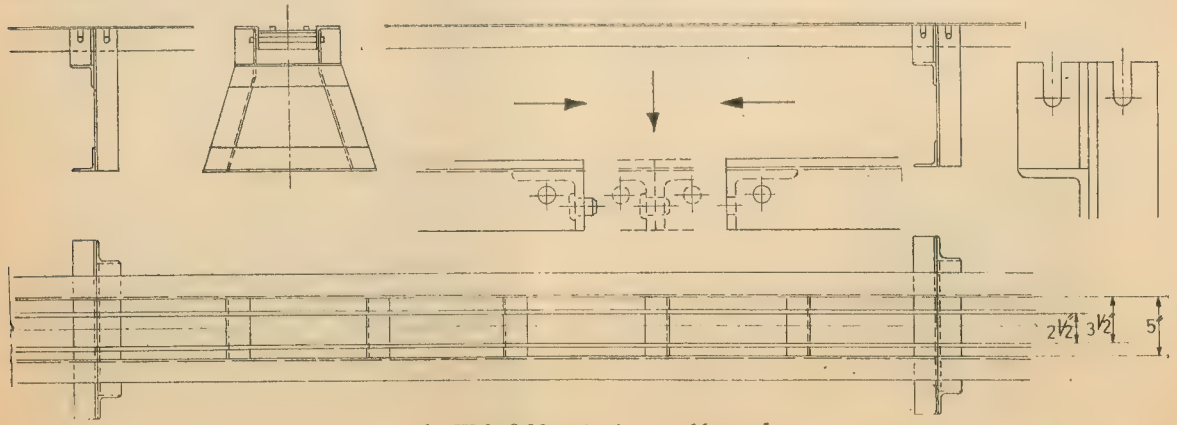
But fortunately a local engineering firm where a member worked, was planning its annual gala and it inquired whether the railway would be ready for that event. The society had to reply that it did not think so as it couldn't get the sections welded in time owing to lack of funds. The firm answered by offering to lend its equipment if the society would agree to run at the gala free of charge. To this it readily assented.

The date of the gala only being a month away, some very hard work by members was called for. This included cutting materials to size and preparing stands and sections for welding—in addition to the construction of three passenger-carrying bogies. However, the job was completed on time, and the society had the first of many great days' running at galas.

Altogether the club have 160 ft of track, which, being comparatively light, is a great help when transporting it. In the original design there was no provision for adjusting the stands for uneven ground, but the society has a selection of wood blocks which are used as packing.

Since this track was made it has been used every summer, and has brought quite a large amount of money into the club. This has been used for the other numerous ventures of a young and ambitious organisation.

J. STUBBS.



The Wakefield society's portable track

A cutting-oil feed for the lathe

In this instalment DUPLEX discusses the piston of the air compressor

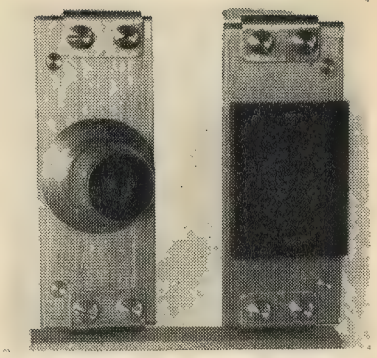


Fig. 16: *The two vice mountings of the washer cutter*

WHERE the built-up type of crankshaft described in my previous article is adopted, the strength of the finished shaft will be enhanced if the diameter of the crank disc is increased to $1\frac{1}{16}$ in. and the recess in the crankcase machined accordingly.

The piston is perhaps the most important single part of the compressor, for on it depends the satisfactory working and the lasting efficiency of the machine.

The piston skirt *F* consists of an inverted cup bored at the top to receive the threaded spigot of the body portion *G*, which houses the suction valve and, at its lower part, carries the gudgeon pin.

The cupped component is best made of plastic material both to save weight and to avoid having to provide lubrication for the cylinder walls. Tufnol is an ideal material for this purpose since it is easily machined to a good finish and has excellent wearing qualities. The Tufnol piston fitted to the cylinder of the jig-saw machine described in this journal has been in use for some years now without lubrication and shows no sign of wear. This material can be machined quite well with an ordinary knife tool, provided that the cutting edge is kept sharp and adequate top rake is provided.

To ensure concentricity, both the outer and the inner surfaces of the piston skirt should be machined at the same setting, and the part should be given a working clearance of about 1 thou before being drilled axially and parted off to length,

The body *G* of the piston is machined from turned duralumin or brass rod, which is centred in the four-jaw chuck for machining and threading the spigot portion. At the same setting the housing for the steel ball is formed by drilling and then machining a flat surface with an end mill or D-bit to make the valve seating. After the spigot has been machined, the work is mounted in a jig for cross-drilling and tapping the hole to receive the gudgeon pin, for it is important that this bore is accurately located on the diameter line of the piston.

On again centring the work in the chuck, the $\frac{13}{16}$ in. dia. flange is turned to size and the skirt of the part is machined to $\frac{5}{8}$ in. dia. before the body is parted off to length.

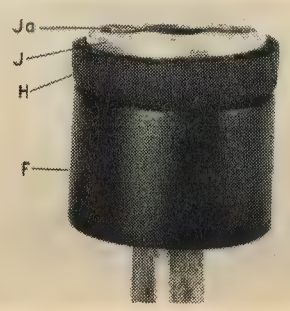
The gap, 9/32 in. in width, to accommodate the small-end of the connecting rod is best formed by removing the bulk of the surplus metal with the hacksaw and then finishing the slot to size by filing; the spigot is hardly strong enough to allow the work to be gripped in the machine vice for machining the slot with a milling cutter. The steel ball is next placed in position and struck a single controlled blow with a hammer and brass punch to provide an air-tight seating. Finally, the upper end of the threaded spigot is cross-slotted with a file to form air passages for the suction valve.

After the piston head *J* has been turned to size from duralumin bar, it is tapped $\frac{5}{16}$ in. × 40 t.p.i. to screw on to the body portion; it is also tapped 8 BA for the two countersunk screws that hold the valve keep-plate in place. By this means the leather cup that forms the air seal is firmly gripped between the skirt and head of the piston.

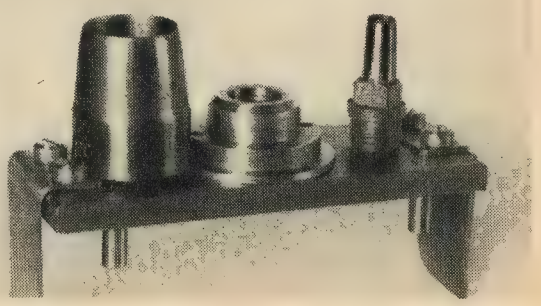
The keep-plate *Ja* is made from 14-gauge sheet steel and drilled and countersunk for the two retaining screws. As this part is fitted flush in the piston head, the mouths of the two 8 BA screw holes are recessed with an end mill or D-bit and a slot is afterwards filed right across the head to accommodate the central part of the keep-plate.

MAKING CUP LEATHERS

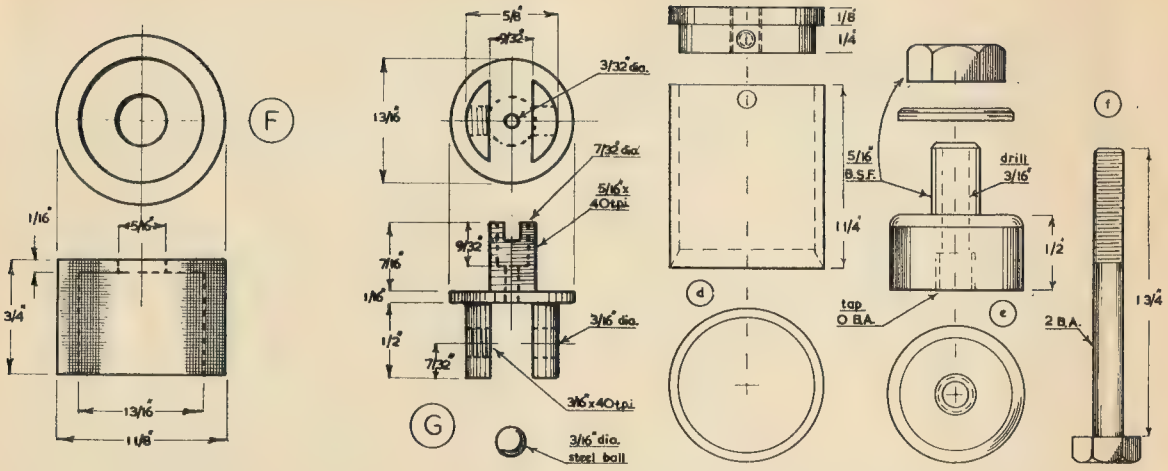
The leather cup washer fitted to the piston serves the same purpose as that used in the familiar cycle tyre pump. It may not be found possible to obtain a commercial cup of the right size, but cups can easily be made in the

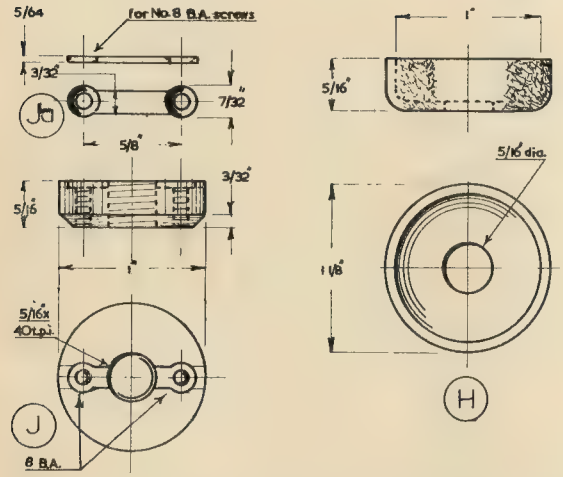


Left, Fig. 13: *The piston and connecting rod.* F *the piston skirt*; H *the cup leather*; J *the piston head*; Ja *valve keep-plate*



Right, Fig. 17: *Showing the punches of two sizes and their mounting plate*





Top left, Fig. 14: F *the piston plastic skirt*; G *the piston body and ball valve*

Left, Fig. 15: *The piston head and cup leather*

Top right, Fig. 19: *The components of the cup leather former*

workshop with the aid of a special jig.

First, a disc is cut to the correct size from a piece of flexible leather of about $\frac{1}{16}$ in. in thickness. The diameter of this disc should be equal to the diameter of the piston head, plus twice the length of the cup's skirt together with a small allowance for forming the bend. The periphery of the disc should be bevelled with a sharp razor blade to promote expansion of the disc by the air pressure set up under working conditions.

For cutting washers and discs of this kind with a central hole, the appliance illustrated in Figs 16 and 17 was made in the workshop for clipping to the two vice jaws.

One plate carries a pair of steel punches which fit on to the stepped boss attached to the baseplate. The other plate is fitted with a piece of sheet plastic to serve as a pressure plate for the work and to save the punches from damage.

These punches, which are of French manufacture, form part of a comprehensive set with a range of from 3 mm. to 30 mm.

With the jig mounted in the vice, a number of concentric discs can be quickly cut out by applying screw pressure. For moulding the leather discs to a cup shape the jig illustrated in Fig. 18 is used, but the diameters of the cylindrical part and its piston are not given in the drawing because these dimensions depend on the size of the finished cup leather required. The jig consists of a length of brass tubing *d*, which, after being faced at either end, is lapped smooth in the bore and flared at the mouth.

The diameter of this tube should be equal to that of the compressor cylinder. The cap fitted to the upper end of the cylinder is tapped axially 2 BA and secured in place with a grubscrew. The plunger *e* is turned smaller in diameter than the cylinder by an amount equal to slightly less than twice the thickness of the leather used to make the cup washer.

To enable the leather to be permanently moulded to shape it will usually have to be soaked in warm water until it becomes soft and pliable. The disc is then placed on the spigot of the plunger and firmly clamped in place by tightening the compression nut on its washer.

Next, the leather disc is entered in the jig cylinder and together with the piston is drawn upwards by means of the screw. While in this position the leather should be allowed to become nearly dry before being withdrawn by a 0 BA screw inserted in the piston.

On being withdrawn, the leather should be removed from the piston and allowed to soak in castor oil to restore its flexibility. The piston can now be assembled and, when entered in the cylinder of the compressor, it should be free to travel downwards on the suction stroke. But, with the top of the cylinder closed with the palm of the hand, the upward stroke should compress the air without leakage past the piston or the suction valve.

● *To be continued*

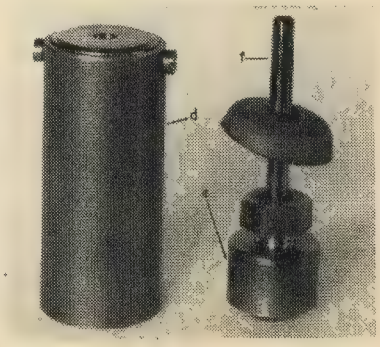


Fig. 18: *Cup leather jig*; d *the cylinder*; e *the plunger*; f *the operating screw*

POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

ANCIENT AND MODERN

SIR,—Traction engine enthusiasts will be interested to hear of an old Fowler ploughing engine which I found in the back yard of a garage at Guardbridge, near Leuchars RAF station in Fife. It appeared, although dirty and covered with grease, to be in reasonable working order, so I went to the house and asked the owner when it had last been used.

He was most obliging, and went off to fetch a photograph which, much to my surprise, showed the engine standing alongside the crippled fuselage of a Hawker Hunter jet fighter.

He explained how, in October of last year, when the Hunter was taking off from the airfield a large bird—probably a seagull had become lodged in the air intake of the engine, and had stopped it, causing the plane to come down and crash land on the mud flats of the Eden estuary.

Little damage was done to the aircraft and the pilot just opened the canopy and stepped out. The difficulty, however, was to drag the machine up on to firmer ground. Several methods were apparently tried, but eventually it was found that the plane would not budge, and they had to resort to the old ploughing engine. Steam was raised, it was driven the mile or so to the scene of the crash, and it winched the Hunter up on to the firm ground with no bother at all.

This is only one example of the magnificent pieces of machinery these old traction engines were—and, for that matter, many of them still are. It is also a very amusing contrast between the ancient and modern: one of Britain's foremost fighter aircraft—and probably one of the most handsome and shapeliest aircraft ever built—being salvaged by this fine old traction engine built not so long after Wilber and Orville Wright introduced to the world the great modern era of powered flight.

Perthshire. W. DRYSDALE.

TAPER TURNING

SIR,—In the May 30 issue of MODEL ENGINEER you include an item on a taper turning device which I submitted.

I had a shock when I read of a taper of 1 deg. 26 sec. but found the fault to have been mine entirely. It should be 1 deg. 26 min., and is, I believe, No 2 Morse taper.

The capacity is 25 deg. included, or 12½ deg. either way from parallel.

Leeds 15. R. MATTHEWMAN.

STORING PETROL

SIR,—The reply to WHS, Brentford [Readers' Queries, May 30], on the subject of deposits in the fuel systems of marine motor craft seems to justify some comment.

The deposits your correspondent is having trouble with result from petrol being stored under unfavourable conditions (i.e., in the presence of moisture and subject to extreme temperature variation) in copper tanks or in copper tube. The copper acts as a catalyst to the reaction since this trouble is not experienced in galvanised tanks. The better the grade of fuel (higher octane) the worse and more tenacious the solid product. Fortunately, it is readily soluble in alcohol, and meths will be found to do a 100 per cent job of cleansing.

I have only known this trouble develop where a copper system has been allowed to stand throughout a winter in a part-filled condition.

In one case within my knowledge a motor cruiser with two 35 gal. copper tanks was laid up with about 40 gal. of premium grade petrol in the tanks. The twin engines were started in the spring and several gallons of this "goo" was sucked through the system and into the engines.

Everything was solid when a second run was attempted. A complete strip and lavish use of meths cured everything except No 4 piston in the starboard engine.

At one time it looked like "out engine" but finally it was freed by removing the head, and burning meths on the crown of No 4 until the gum softened. The engine was then cranked while meths was fed to the bores and thus pistons and rings freed. Needless to say the oil was then changed.

The moral of all this is *don't* store petrol in copper containers for lengthy periods.

Bosham, Sussex. H. W. HAMBLIN.

CI FUELS

SIR,—In reply to IBD's query [May 30], the mixture I use for c.i. engines is: equal quantities of ether, paraffin and castor oil.

This gives quite a good running performance, and is quite cheap. A pint of BP veterinary castor oil costs about 5s., a large bottle of solvent ether costs 3s. 6d. To this mixture a small amount of amyl nitrate can be added (about 3 per cent). This acts as an automatic compression raiser, but

QUEEN MARY II *off Port Glasgow (before conversion) and, right,* JUPITER *arriving at Lochguillard*

is rather expensive as it costs 7d. for a small ampoule.

Using the above formula, three to four times as much fuel can be made for the price of a bottle of proprietary fuel.

Leeds, Yorks. D. HALEY.

[*The querist referred to was mainly concerned with the possibility of eliminating the need for ether in "diesel" fuel. Mr Haley's formula is a well-known one, and is used by many owners of these engines who prefer to compound their own fuel, but advantages are claimed for the proprietary brands, to offset their greater expense.*—EDITOR.]

REGULATIONS DOWN UNDER

SIR,—I notice that information is required by a model engineer emigrating to New Zealand. Here are some particulars and other information which would be useful.

Mains voltage, except for a very few isolated cases, is 230 v. 50 cycle single-phase and 400 v. 50 cycle three-phase in both islands of New Zealand.

Regulations regarding home workshops vary according to city, borough or county by-laws, but there is no difficulty whatever. A new building would require a permit, which, provided the construction meets the local authority's by-laws, is readily secured.

Electric wiring *must* be done by a registered electrician, but as electricity is plentiful there is no trouble about permits.

There are few towns in New Zealand with a gas service and where gas is available it is usually in the older parts of towns. Few new services are being laid.

Model engineering requisites are not readily available but small tools are quite plentiful, except taps and dies. My company are supplying tools and materials for model engineers all over New Zealand, and model engineering taps and dies are our great headache as are castings for LBSC locomotives and other models described in ME. However, materials, with the exception of small bolts, screws and nuts, flat bright and angle steel, are obtainable.

Your reader would be well advised to leave as much cash in a bank in England as he can afford, as he will find it useful at a later date. It is not easy to remit money from New Zealand unless one can produce invoices for goods sent in the form of shipping documents.

That is where your advertisers fall down badly. It seems too much trouble.

Stuart Turner castings are quite plentiful as there is a New Zealand representative interested in all Stuart Turner products.

Your reader is wise to bring his own lathe, drill and grinder, and for his information I can add that anyone coming to New Zealand is able to bring £300 worth of personal effects duty free. However, lathes and other machine tools are duty free.

There is no purchase tax in New Zealand, and a sales tax applies only to lines that would not affect the home workshop owner.

Model engineering societies are: Warkato SMEE. Their registered office is my office at 74 Ellis Street, Frankton Junction, Hamilton, New Zealand. They have a railway track 475 ft, lake, etc. New Plymouth MES, New Plymouth; railway track 350 ft. Wanganui MEE, Wanganui; railway track 500 ft.

The above are in the North Island. In the South Island are: Otago SMEE, Dunedin; railway track, car race track and boat pond. Canterbury MES, Christchurch. Invercargill SME. Marlborough SME.

Hamilton, NZ. G. W. HOPE-JOHNSTONE.

ROLLERS IN AUSTRALIA

SIR,—Shortly after coming out here, I saw a steam roller made by Clayton and Shuttleworth, of Lincoln, in 1908. Having lived for many years within sight of Lincoln cathedral, I spoke to the driver, who was most interested. In fact, when the foreman came up to discover why the roller had stopped working, he was brushed aside with: "Gent from England—knows these rollers."

The machine looked well-kept and painted, and I have an excellent colour photograph of it. When I asked the driver how he liked the C and S steamers, he replied: "The old girls go well, and will out-last the Sydney Tramways."

The Sydney Tramways Department purchased Nos 1-4 of these rollers in 1908.

Australia. L. B. WINTER.

FESTINIOG LOCO

SIR,—In reply to Mr J. S. Jones, of Wrexham, I should say that the most likely reason why the above locomotive was cut up by the Festiniog Railway was to raise money for the continued operation of the line. No doubt if Mr Jones had offered to buy

Four clothes posts in two

STUDENTS of algebra are familiar with the proof that 2 = 1. G. C. Willis has recently demonstrated its practical value in a novel way. He has built a clothes post attachment which, fitted to each of two posts, enables you to stretch two lines between them.

A horizontal crosspiece serving this purpose has one fundamental disadvantage: unless the lines attached are an impossible distance apart, the clothes foul each other as soon as a brisk breeze gets up. G. C. Willis has constructed his device so that one line is above the other and—here is the really clever bit—the whole thing is reversible. When the wind is blowing in the opposite direction you can swing the attachment through an angle so that, once again, the clothes on one line do not get in the way of the clothes on the other.

The finished job is not very big but its construction demands a fair amount of accurate machining. The principle on which it works, as in most good practical devices, is a simple one. Housewives with small gardens for hanging space will find its value out of proportion to the simplicity of the principle.

If you want to do your wife or family a good turn, build this attachment from the drawings and details in the July issue of *Home Mechanics*, now on sale at all bookstalls, price 1s. 3d. or 1s. 6d. from the publishers, Percival Marshall, 19-20 Noel Street, London, W1.

This issue also has notes and working drawings for a handsome brass candelabra, the sort of thing you can build for next to nothing from the bits of scrap brass you have in your junkbox. (This gives you a big advantage—who ever heard of an ME reader without a junkbox ?)

The July *Home Mechanics* is full of useful articles including one on building a three-speed gramophone deck and another on building the furniture for a 15 ft caravan. Owners of Bond Minicars will find also a brief but authoritative servicing guide and there are handy articles on renewing sashcords and domestic boiler maintenance.

Many readers were disappointed when the June issue sold out very quickly. Buy a copy without delay from your nearest stationer or bookstall. It will be 1s. 3d. well spent. ▣

POSTBAG . . .

it to present to the Towyn Museum his offer would have been given consideration.

With regard to Mr B. A. Wyatt, of Birmingham 20, I suggest he gets in touch with the secretary of Birmingham and Midland Area of the Festiniog Railway Society, namely Mr A. Pratt, of 58 Middleton Hall Road, Kings Norton, Birmingham 30.

Mr Pratt has done a lot of research on the NWNG Railway and has built some very fine models to 16 mm. scale.

South Yardley, Birmingham. D. F. FELTON.

WITHOUT TOOLS

SIR,—The traction engine in my picture is a good example of what can be done by a keen person, with skilful hands, but no machinery. My firm supplied the British-made, finished cylinder complete, the crank, connecting rod and eccentric and rod, also the pressure-gauge, water-gauge and lubricator.

The boiler was first built from a piece of 16-gauge brass tube. It was cut lengthwise, and crosswise, so as to open up and form a firebox, and this also provided a flat surface to which the tender was later built on. Brass tube was standard thin-wall refrigerator tube, about 3 in. o.d. A disc of brass was silver soldered into each round end, and the furnace tube made up out of $1\frac{5}{8}$ in. o.d. tubing in which eight cross tubes had been silver soldered, these being $\frac{5}{16}$ in. standard copper tube.

A brass end cap for a refrigerator tube formed the smokebox. The stack was worked up by hand into an oblong shape at the smokebox and flared round at the top. The exhaust pipe from the cylinder comes in at the base of the stack, and the increase in draught with the engine running can be easily seen at the burner flame, which sharpens up immediately.

The builder had a pair of ball bearings to fit the $\frac{1}{4}$ in. dia. bought crankshaft, and these he mounted in copper-tube housings, part of the copper tube being worked down to provide mounting flanges on the boiler. These were secured with small screws and nuts and soft soldered so as to be fixed.

A U-shaped piece of brass was secured to the cylinder and it was located on the boiler for the correct clearances and valve operation—a matter of trial and error—and it was secured with screws and solder.

The steam valve, exhaust pipe, lubricator and pressure-gauge followed but the water-gauge presented a problem. If it had been put in the "cab" it would have been too awkward to manage. But as the engine was to operate and not merely be an ornament, the water-gauge finished up on the side of the boiler.

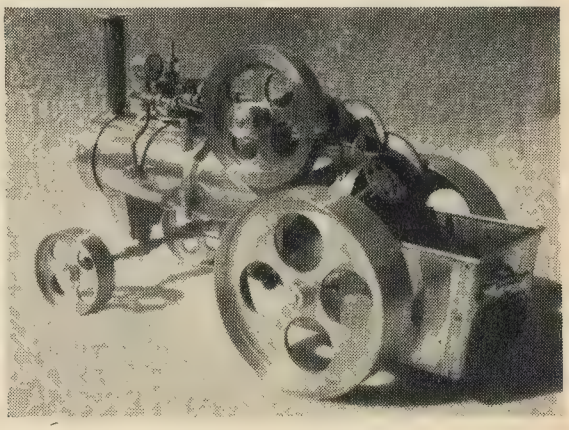
The boiler was steamed first with an alcohol blowtorch, and worked right from the first.

Having no lathe at that time, the wheels were a problem to the modeller, and, of course, a better flywheel was required than a round disc used at the first attempt. A friendly machine shop turned up the flywheel from a scrap brass end and the four road wheels were made also by him from solid.

The gearing both for driving wheels and steering was from war surplus parts.

The final burner was made from a refrigerator tube cap, silver soldered, and the old blowtorch needle valve and tube found a final destination. It is a simple burner and very effective. Steam is raised in about two minutes without any help.

California. G. ROSEKILLY.



The traction engine that was built without machine tools

GAS ENGINES

SIR,—In Smoke Rings of May 23, gas engines are spoken of as if they were things of the past. However, they are still made today for at least one purpose.

Many large inland towns have sewage purification works in which the sludge collected is digested in closed tanks. The methane gas thus produced is used to drive gas engines. These engines may either drive pumps directly on generate electricity as a source of power for the works.

I am sure that anyone interested in such engines would be given facilities for inspection. Inquiries about the existence of such engines should be made to the Borough or City Engineer.

CHARTERED CIVIL ENGINEER.

HAPPY HUNTING GROUND

SIR,—Portable engine enthusiasts who live near Enfield, Middx, may be interested to know that I have recently come across a yard full of them. The yard is at the northern end of the eastern side of Brimsdown railway station on the ex-GER line from London to Cambridge.

As a locomotive enthusiast I was not able to recognise the manufacturers but they were in varying conditions, from a newly overhauled condition to a mass of rust.

Brookmans Park, Herts. R. NIXON (aged 16).

CUTTER'S TEMPLATE

SIR,—I am very much of a mind with Mr B. J. Whitehead [Postbag, March 21] regarding templates for forming gear cutting flycutters and have often wondered if such templates were procurable.

I would even go further than Mr Whitehead and say that the flycutters themselves, ready ground to shape, would find a ready market, singly or in sets, but I think that the template idea would better meet an emergency and I would many a time have been glad of a set of such templates, professionally, during the last war.

Picton, New Zealand. J. E. ROBINSON.

SILVER GHOST MODEL

SIR,—As an ex-Rolls Royce driver I have always wanted to make a model of the 1907 Silver Ghost. I wrote to Rolls Royce for data on it but unfortunately all records had been destroyed by enemy action; but

they very kindly sent me photographs of the original and an invitation to view it in their showrooms.

Recently I went to the model engineer's paradise, the Science Museum, and there was the model on show.

If any reader has any drawings on the Silver Ghost I should be pleased to contact him.

Surbiton, Surrey. G. ROGERS.

DISPLAYING MODELS

SIR,—This is my model engineering jubilee year. Of ten models I have built, seven have won awards at provincial exhibitions, including several firsts. The other three were simple models.

If I were asked why I had been fairly successful I would say it was because I have always made myself conversant with the prototype.

With the increasing rate of modernisation, future model builders will have to rely more and more on museums, but cannot something be done to improve the standard of models shown in museums? Where an occasional masterpiece is on view, it is often as not set between items of junk. Too frequently the labels tell more about who presented the model than about the model itself.

I believe model engineering societies could also improve the quality of members' work by taking a lesson from photographic societies and having meetings devoted to criticism. The critic is often unpopular with model engineers.

May I appeal to model steam engine builders to demonstrate their models at exhibitions under steam, then visitors will know that faults are not being concealed?

At five Northern model exhibitions I have shown the only steam driven models working.

Shipley, Yorks. FRANK D. WOODALL.

Rust in the home workshop

continued from page 933

lamp with this connection is much lower, as each burns with a red glow and does not cause scorching, even if held against the human skin. In addition, this arrangement distributes the heat better than one lamp if the two lamps are placed some distance apart.

The only lamp which could safely be used alone is a 5 w. neon-type lamp sold as a night light. This would, in all probability, give out sufficient heat for the cover for a small lathe.

A lathe cover to enclose the average 3½ in. lathe of the Myford type, with its motor, countershaft and, possibly, a small cupboard for valuable tools, would be about 4 ft long, 2 ft high and 2 ft wide. The arrangement of two 40 w. lamps in series keeps this size of enclosure about 8 deg. F higher than the temperature outside the cover and should be ample to prevent condensation and rust. And if a bag of silica gel is placed inside the cover, the lathe could be left for weeks on end without fear of deterioration (Fig. 2).

It may be felt that leaving a couple of lamps burning day and night will be costly. This is not so. The suggested arrangement of two 40 w. lamps in series will give an electrical load of 20 w. only, and this will consume one unit of electricity in 50 hours. This is a small price to pay for freedom from worry about the lathe, as, with electricity at 1d. per unit, the cost of one cigarette will look after the equipment for a period of four days. The same cost would keep a 5 w. lamp burning for 16 days.

There are alternative forms of low temperature electrical heat. If there is room, a low-temperature tubular heater can be used, and the loading of this is usually 60 w. per ft. Alternatively, soil heating or anti-frost heating cable can be used at a loading of about 75 w., but for the average lathe cover this is more than required, and it entails extra expense in installation and running costs. ▣

Muncaster models

continued from page 922

horizontal direct-acting engines.

The swinging anchor link of this engine is shorter than on many Grasshopper engines, being pivoted from a trunnion on the level of the entablature frame, which is supported from two pillars at this end and from lugs on the cylinder at the other. More commonly, the anchor linkage was pivoted from bearings on the bed plate or engine floor.

The radius rods of the parallel motion are anchored to vertical pillars supported from the cylinder, and stiffened by diagonal struts. A normal type of slide valve is employed, operated by means of an eccentric on the engine shaft, by way of a horizontal eccentric rod and rocking levers, on a cross shaft at the left-hand end of the bed plate. Governing is by means of a crossed-link centrifugal governor operating a butterfly throttle valve, seen immediately below the steam chest. A plunger feed pump is provided, operating from a gudgeon pin near the anchored end of the lever at approximately 1/5 of the cylinder stroke.

For readers who wish to obtain further information on Grasshopper engines, it may be mentioned that an excellent article, with complete working drawings, of an Easton and Amos Grasshopper Engine of 1862 by A. Ebeltoft, a Norwegian reader, was published in the issue of ME dated 31 March 1949.

Although there is much more which could be said about the Muncaster designs, and I have received many letters from readers commenting on them and raising points for discussion, this series has already run beyond its allotted span, and there are urgent demands for articles on other subjects. I propose, therefore, to take leave of Muncaster, at least for the time being, but I assure readers that I shall be returning to the subject of steam-engine construction again as soon as possible. ▣

Tommy Dodd

continued from page 923

and would defy all use of the few controls to move them! Should the engine by chance be in gear, I have seen two men on the gear lever and another with a crowbar develop maximum horse power in order to shift it. But the language. . . .

This engine was taken with my first camera at Bower Farm, Eynsford, in 1915. It was broken up soon afterwards, when the first of those huge picturesque Fowler compounds superseded them. The magnetic attraction of these giants, be it high summer or deep winter, was the cause of much trouble with schoolmaster and parents alike, but they were very happy days.

Incidentally, while on the subject of single-engine ploughing, a well-known farming journal published a picture in the early days of the war of a somewhat similar engine working near Rye, Kent. The winding drum was on a truck alongside the engine in the field, the crankshaft being connected by a universal joint to the winding gear.

Perhaps a reader in that area might feel interested enough to fill in the gap, especially about the anchor truck. ▣

READERS' QUERIES

Do not forget the query coupon on the last page of this issue

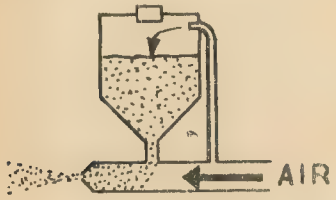
This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W.1.

Sand blasting

I have made some experiments with a sand-blasting appliance similar to that described by Duplex. A visit to a local foundry revealed that commercial varieties of this apparatus work on a different principle, one of which appeared much more efficient and simpler. I was not able to make any inspection of the foundry machine, but I deduced that it was constructed as in my drawing.

An experiment with a tin can and odd bits of tube proved quite encouraging. Using only 15 p.s.i. (on account of the tin) and a coarse steel grit, together with a $\frac{1}{8}$ in. nozzle, the resultant blast gave a frost on the glass very rapidly. I should be grateful if you would give your opinion on the following points, as I wish to obtain optimum performance from the appliance. (The compressor delivers 8 cu. ft per min.)

1 Pressure being equal on both sides of the container delivery orifice, the



The form of sand blasting appliance described by querist DHG, having a pressurised sand container with gravity feed

grit is gravity fed: can you suggest a suitable size for this hole?

2 Is there a calculable ratio between this hole and the size of the nozzle hole?

3 What thickness of steel plate should be used for the container (working pressure 60 p.s.i.)?

4 Can you suggest a suitable compound with which to line the cabinet (something that can be spread in a thick layer and will set to a resilient, rubbery consistency)?

5 As glass is rapidly frosted by this process, what material could I use to provide an observation window?—DHG, Eastry, Kent.

▲ *A disadvantage of the method shown in your sketch is that it would only work for a limited time and would then have to be shut down and refilled, whereas with the injector the sand vessel is not under pressure and the sand can be made to run back by gravity into the feeding hopper.*

With reference to your specific queries:

1 *It is difficult to suggest a suitable size for the container delivery orifice, but it must obviously depend on the rate at which the grit can feed under gravity.*

2 *Again, it is difficult to give you any definite advice, but there is no doubt that experiment would be called for in any case.*

3 *You have not stated what size of container you propose to use. But assuming a diameter of about 9 in., the thickness of plate should be not less than 3/32 in. or 14 gauge, and the top-end plate—if flat—should be of thicker material and not less than $\frac{1}{8}$ in. with either brazed or soldered joints.*

4 *Either synthetic rubber or p.v.c. plastic material could be used for lining the cabinet, but the method of applying it would possibly present some difficulty. Therefore, it would be best to apply it in sheet form, using a rubber cement or similar adhesive to fix it.*

5 *Practically all transparent materials are liable to be frosted by the sand blast. A comparatively soft flexible material such as p.v.c. would be better than a rigid transparent material, but in any case the best thing to do is to try to keep the observation window well out of the line of the blast.*

Stage lighting

I wish to make a resistance for dimming the lights in our local arts club theatre. The smallest load would be 100 w. and the maximum 600 w. I should be grateful, therefore, if you could give me any help on the design of this device. None of my electrical books gives any information whatever on this subject.—RRC, Molo, Kenya.

▲ *It is not possible to give you exact data for a dimmer because you omitted to state the voltage it is to be used on. However, it is assumed that it lies between 200 and 240 v., and the following values will cover this range. Obtain a length of asbestos tube or similar refractory. The resistance wire is wound on this tube; the tube should have a sliding contact that can be moved along its length. Spacing of the wire may be necessary, but if you use oxydised wire the turns may be wound close together. For the resistance you will need approximately 160 yards of 20 s.w.g. nickel-chrome resistance wire. Where an alternating current is used, it is usual to use a choke coil as it is more economical than a resistance.*

Now, an alternative arrangement: procure a wood tub or barrel—one about 18 in. deep will do. At the top of the barrel fit a simple windlass. From this is suspended on a strong cord an iron plate cut to triangular shape; suspend this with an insulated wire attached, point downward. At the bottom of the barrel fit a disc of either iron or lead and attach an insulated wire to this too. When the windlass is wound up the angleplate should be clear of the liquid in the barrel. Make up a strong solution of either common salt or washing soda. Fill barrel, but not right up to the plate. The two leads will connect in the lamp circuit as a series connection. (It may be necessary to adjust the solution to suit working conditions.) Lower the angle plate slowly into the liquid, and as the tip reaches it the current will flow through the circuit; the value will increase as the plate is lowered.

The plate need not actually touch the bottom plate for full contact—this can be taken care of by the strength of the solution.

Dividing head castings

I wish to make the dividing head described by A. R. Turpin in ME some years ago, but am unable to make the castings myself. However, I think I have seen them advertised and shall be obliged if you can inform me of the source of supply.—CWB, Berkhamsted, Herts.

▲ *Castings for the Turpin dividing head can be obtained from W. D. Urwick, The Hollies, Taplow, Bucks, and from W. H. Haselgrove, 1 Queensway, Petts Wood, Kent.*

CLUB NEWS

EDITED BY THE CLUBMAN

WHEN the Model Engineer Exhibition opens in London on August 21 the South will see some of the best work to be done in recent years by the modelling craftsmen of the North.

As most readers are well aware, the **Northern Association of Model Engineers** holds an exhibition in Manchester every year. Some of the trophy-winners in Manchester are now being invited by the association to enter their models for display on the association's stand.

Everyone will want to see these models. They are built with all the skill and care that characterise the solid North.

Formed in 1945

The NAME has a membership of more than 30 clubs and about 700 individuals. It was formed in 1945 to give the modelling movement in the North a fresh stimulus at the outbreak of peace.

All the member clubs are automatically covered against third-party insurance claims, and all the club members against personal accidents in any branch of model engineering whether they be working at home or elsewhere.

ROAD TO THE LAKE

Bitterwell Lake will be sweeter on June 30 when **Bristol SMEE,** in which Bristol MPBC is incorporated, holds its first regatta there.

How does one get to Bitterwell Lake? So that no one shall lose his way, A. E. Kerswell, the power boat secretary, explains that it is first necessary to reach the district of Downend where there is a signpost for Westerleigh, on a secondary road. Take this road as far as the signpost showing Bitterwell, then turn left 300 yards—and behold, the lake!

Another route, but a longer one, is by the main road from Downend to Coalpit Heath.

"We are very small in numbers for a venture of this kind," says Mr Kerswell, "and we hope to get as many competing visitors as we can even if they take home all the prizes. We shan't mind their doing that."

The organisers' one aim is to make the event attractive. To this end they are providing such important details as a public-address system and electric timing. There will be a car park, refreshments and (if it rains) cover for everybody.

LONELY IN WEST LONDON?

Variety in the programmes helps to account for the success of **Acton MES,** a society which I commend to the attention of model engineers who may be feeling a little lonely in West London.

At a meeting earlier this year R. Bacon spoke on radio control. The next subject announced by secretary P. A. Franck (29a Acacia Road, Acton, London, W3) was Early Steam Engines, a talk by treasurer J. Kneebone.

Chairman S. Frost and his fellow members are always pleased to meet members of other clubs at the Acton headquarters, while anyone who wishes to join will find himself welcomed in the best spirit of the movement and quickly made to feel at home.

NEW VENUE

With August as an exception, **Manchester SMEE** is meeting nowadays in the Onward Hall at Deansgate on the first Friday in each month. The meetings open at 7.30 p.m.

H. Stubbs of 23 Ashdene Road, Heaton Mersey, Stockport, is now secretary and treasurer.

M.E. DIARY

June 28.—IEE Teaching Exhibition, Northampton Polytechnic, St John Street, London (6-8.30 p.m.).

June 29.—Rempstone Steam Rally, 2 p.m. (June 29 and 30; divine service, Sunday, 2 p.m.). Birmingham SME track running at Campbell Green.

June 30.—Bristol SMEE power boat regatta, Bitterwell Lake, near Downend. Mortlake MPBA radio-controlled regatta. Sussex MLS visit by SMEE.

July 3.—Sevenoaks and District MES, permanent track opening, 7 p.m.

PHOTOGRAPHIC COMPETITION

CONDITIONS OF ENTRY

1. The photographs submitted shall be of any form of model engineering and must be taken by the competitor but may be developed commercially. Prints should be unmounted, not more than 10 in. × 8 in. and not less than half-plate (4½ in. × 6½ in.).
2. Competitors may send more than one photograph but each must have a coupon from Model Engineer firmly pasted on the back. Coupons will be published each week until the closing date.
3. The closing date will be July 31. Entries to be sent to: Photographic Competition, Model Engineer, 19-20 Noel Street, London, W1.
4. A first prize of £10 will be provided, with second prize of £5 and third of £3. In addition, 10s. 6d. will be paid for each other photograph published in Model Engineer.
5. Prints will not be returned and the Editor reserves the right to publish any of them in Model Engineer.
6. Copyright of photographs sent must rest with the competitor.
7. The decision of the Editor shall be final in any question affecting the competition.

ENTRY FORM

(To be pasted on the back of each entry)

Name.....
(Block letters)

Address.....

.....

If member of a club, give its name .....

.....

I agree to the conditions and certify that I took the picture submitted.

Signed.....

DETAILS OF PHOTOGRAPH

Title .....

Builder of model(s) in picture:

Name .....

Address .....

.....

Further details of model(s).....

.....

.....

Camera..... Exposure.....

Film or plate..... Lighting.....

Stop.....

Any other information.....

.....

.....

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

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Outboard Clutch Brake. Fitted in place of normal pulley, saves continual starting and stopping of motor. S.A.E. details. Price £5 19s. or 19s. deposit and six monthly payments of £1.—WANSTEAD SUPPLY CO., 30, The Broadway, Woodford Green, Essex.

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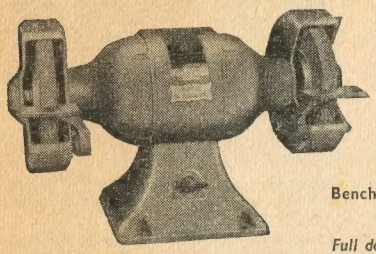

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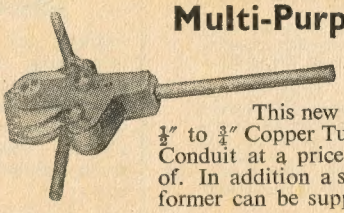

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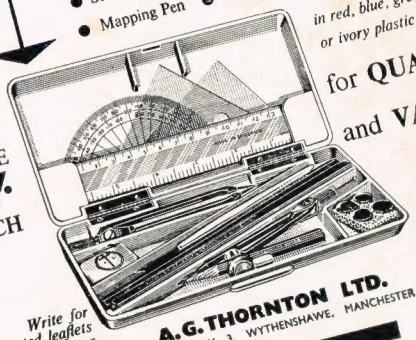

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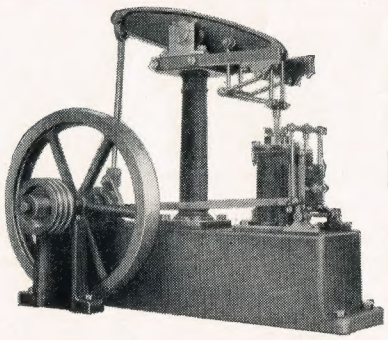

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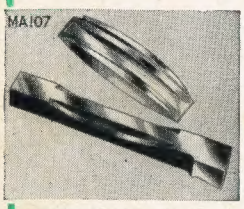

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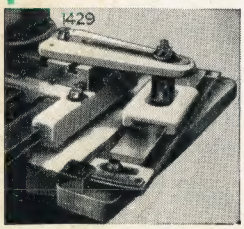

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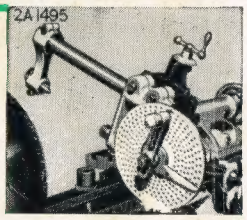

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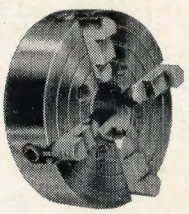

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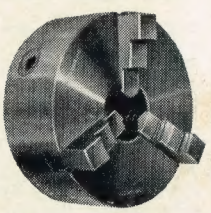

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